

# Comparison of GMI output for lightning simulations with SHADOZ O<sub>3</sub> profiles

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- For year 1 of the GMI simulations, hourly model output was archived on 20 pressure levels at the location of SHADOZ O<sub>3</sub> sondes
- Ascension Island and Nairobi, Kenya (1998-2004 data; one sonde per week with gaps)
- All model output and sonde data were used to create:
  - 1. Vertical profiles (Model versus SHADOZ for no lightning, default lightning, and new lightning simulations)
  - 2. Curtain (time series) plots
  - 3. Probability distribution functions
  - 4. Percent lightning contribution plots

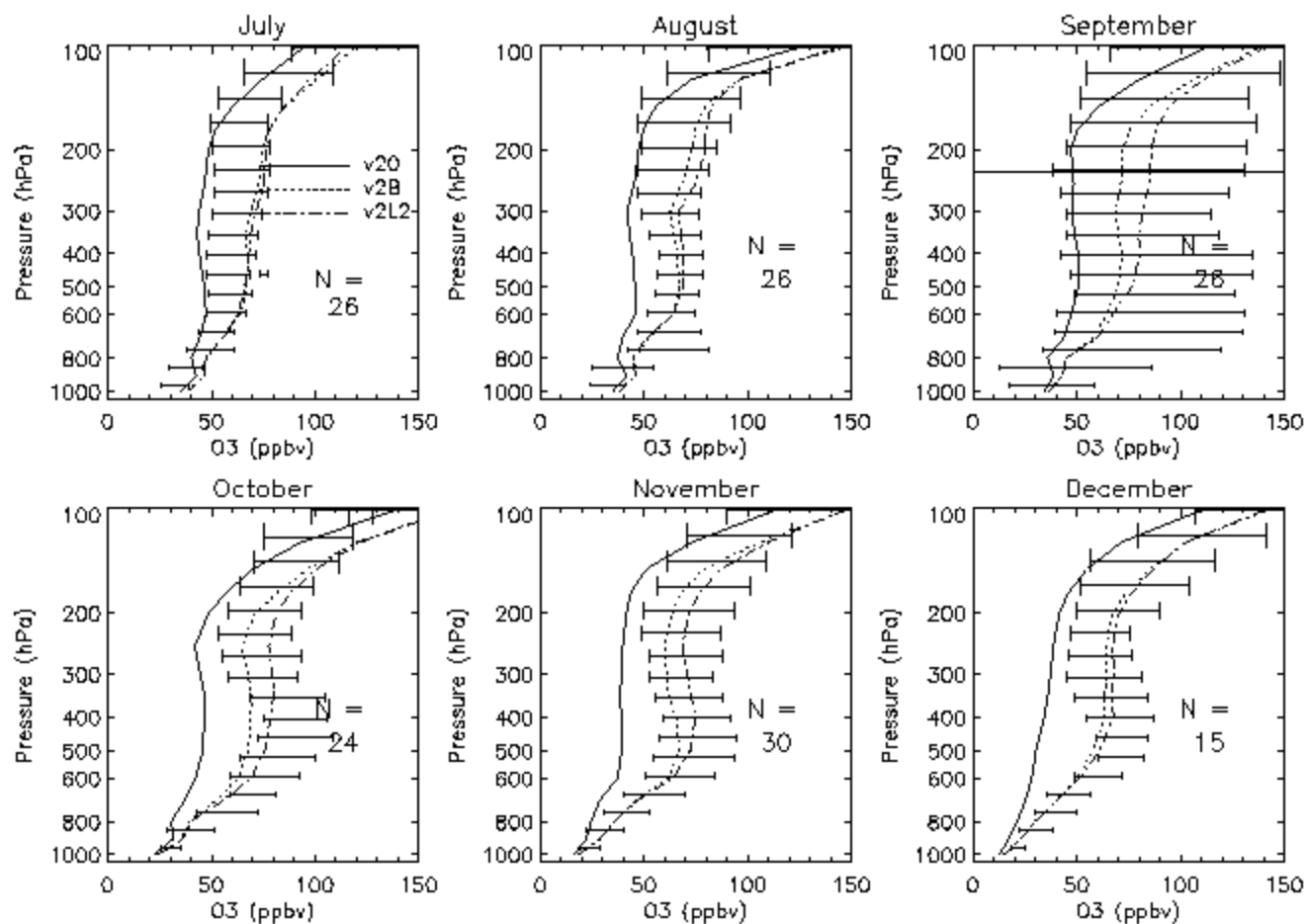
# SHADOZ Sites

Click on a site to access the data archive.

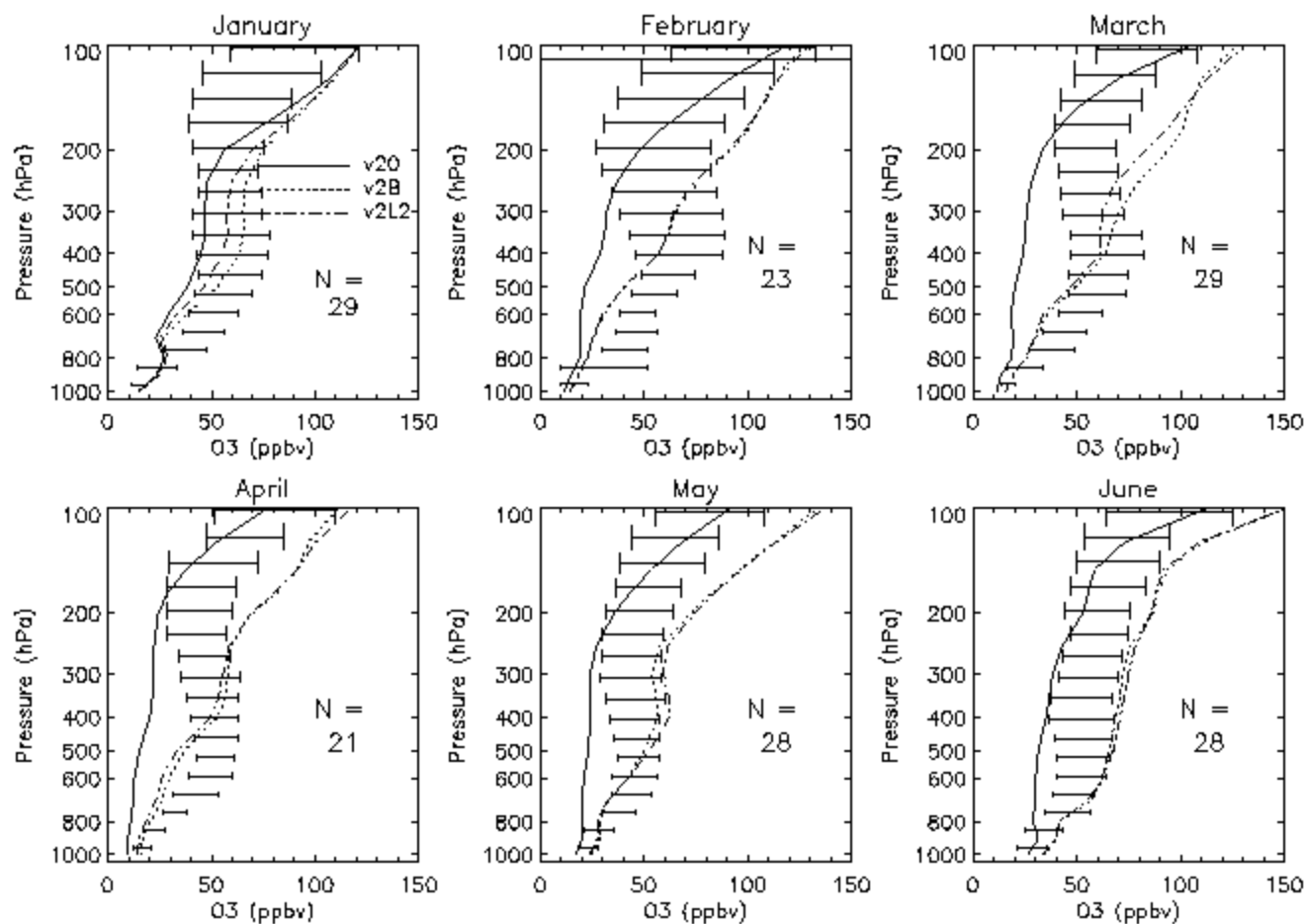


Anne. M. Thompson, PI

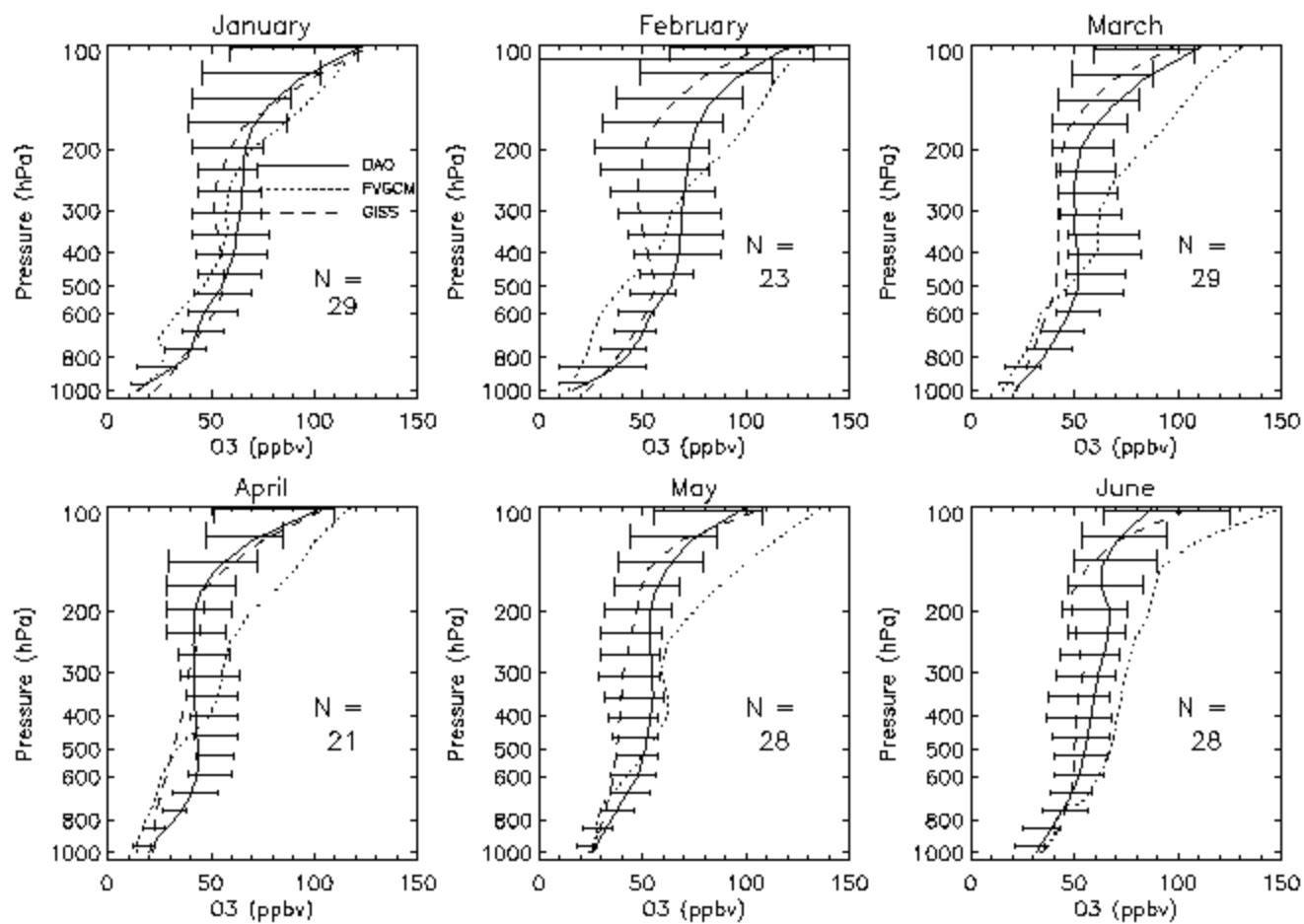
site: Ascension ( -7.98 deg lat, -14.42 deg lon), model: DAO



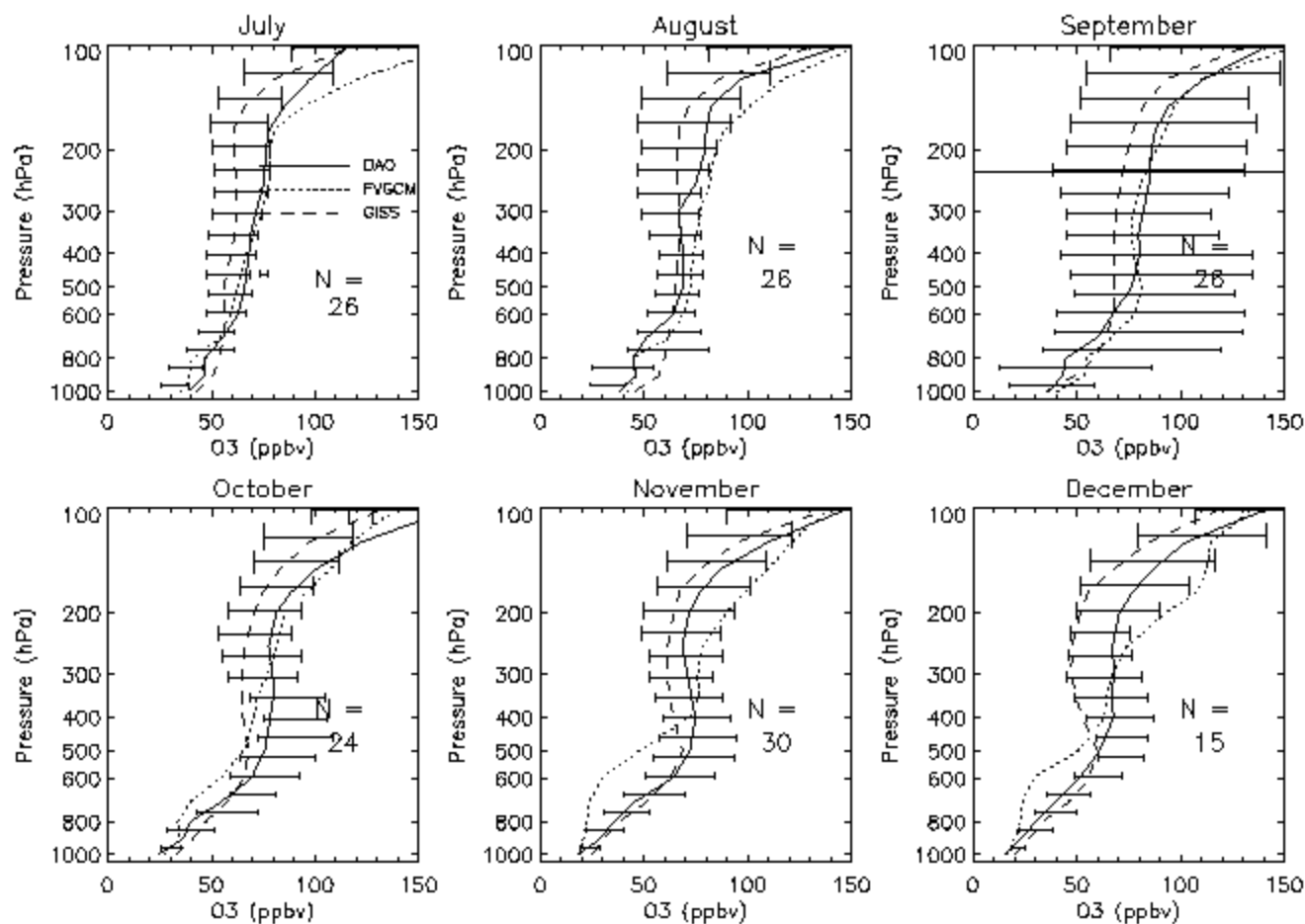
site: Ascension ( -7.98 deg lat, -14.42 deg lon), model: FVGCM

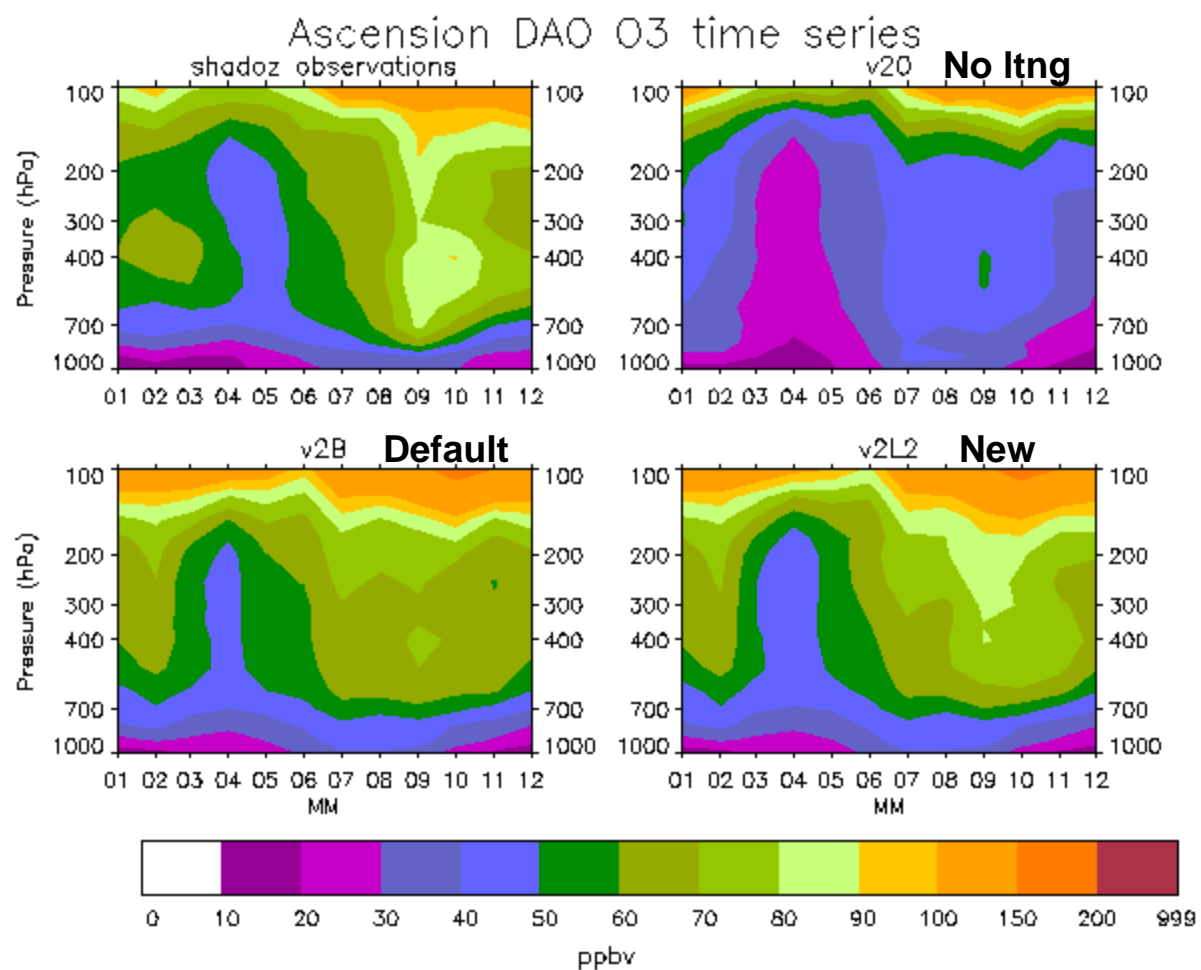


site: Ascension ( -7.98 deg lat, -14.42 deg lon), lightning flag: v2L2

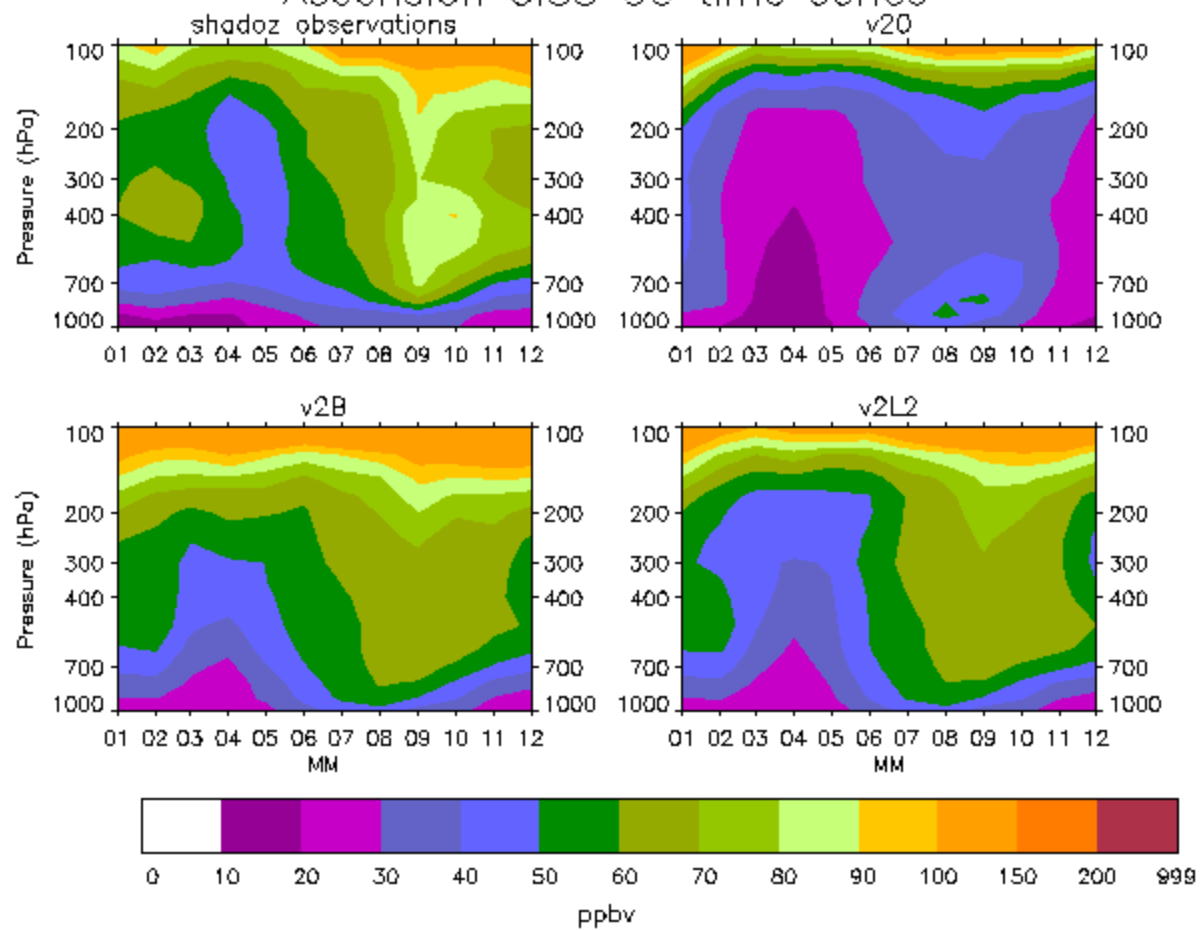


site: Ascension ( -7.98 deg lat, -14.42 deg lon), lightning flag: v2L2



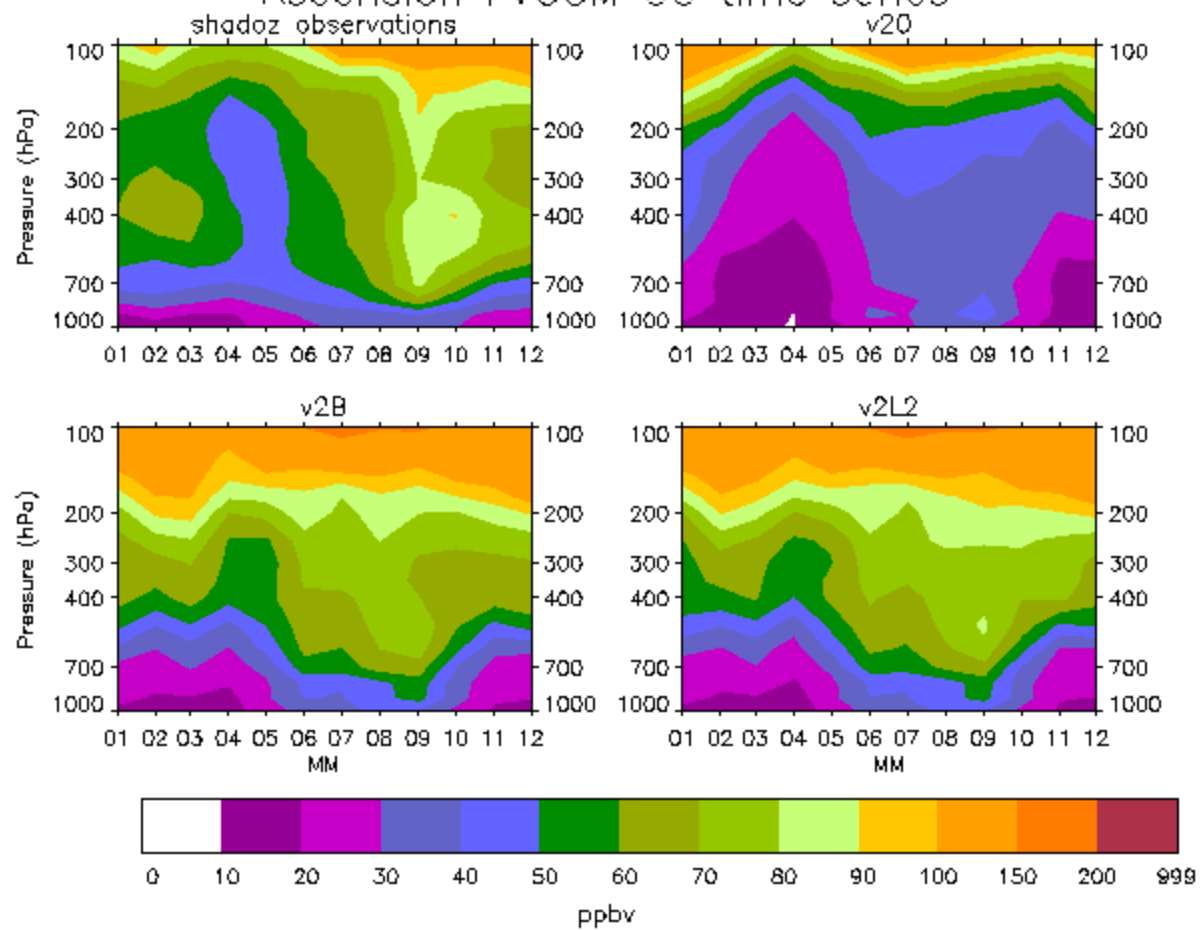


# Ascension GISS 03 time series

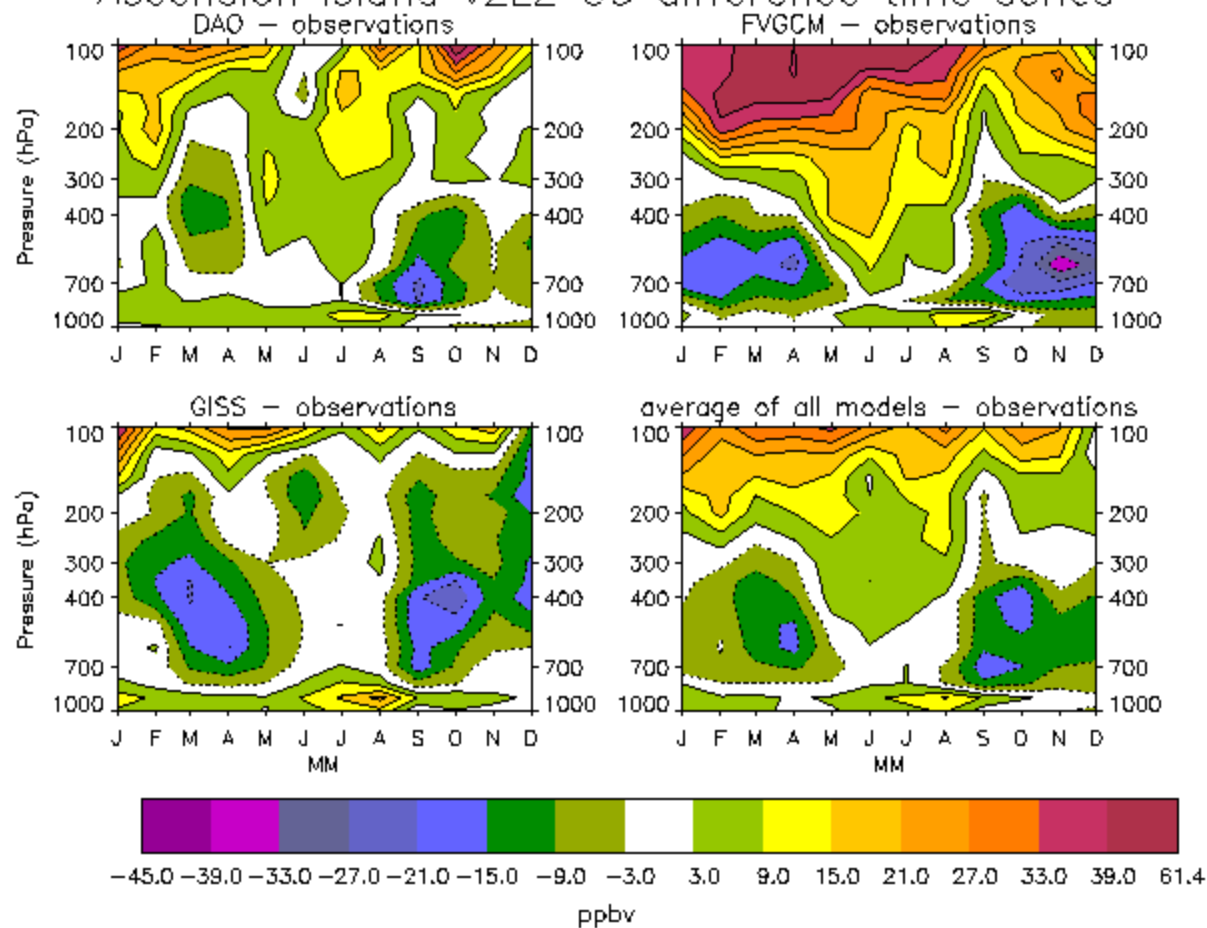




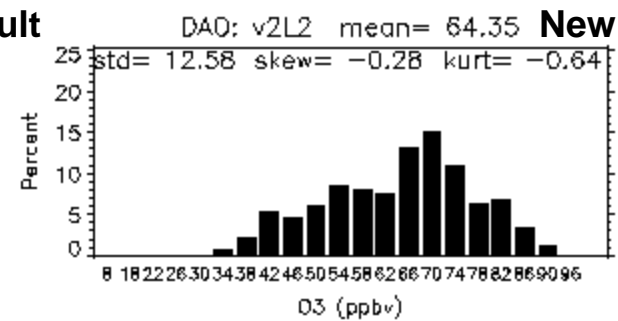
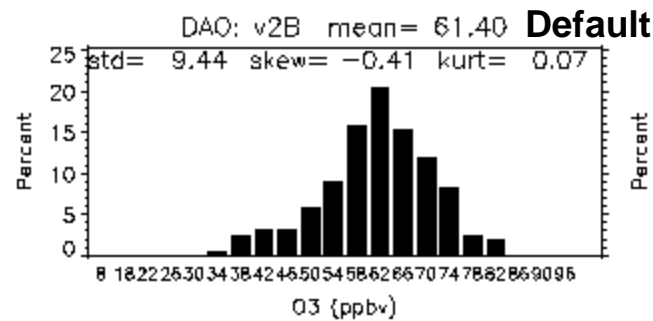
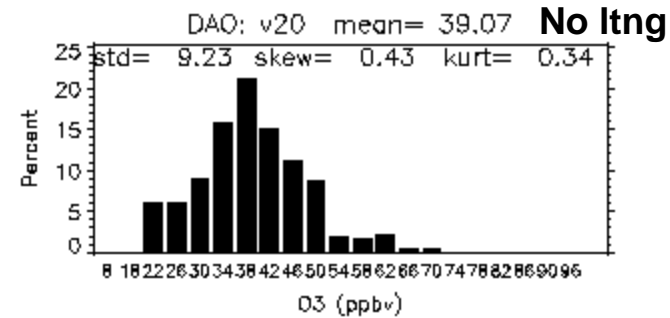
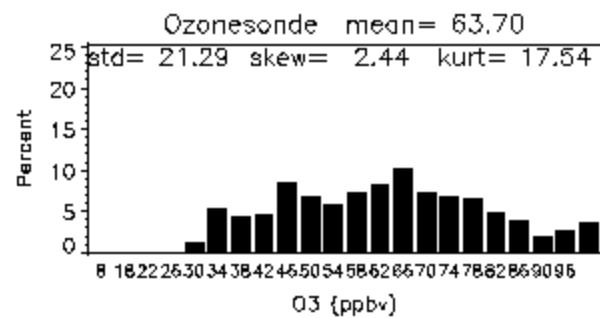
# Ascension FVGCM O3 time series



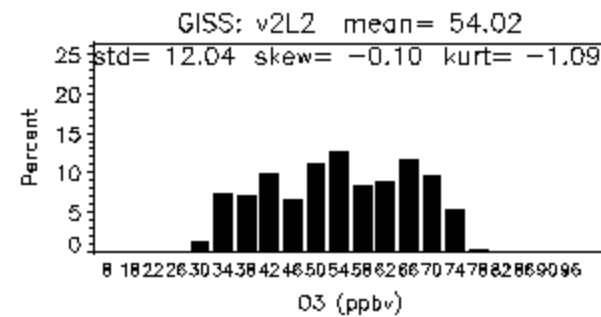
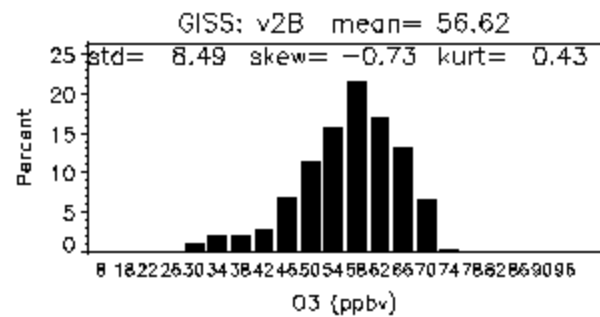
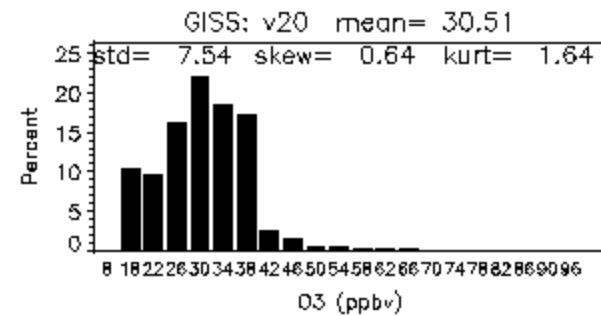
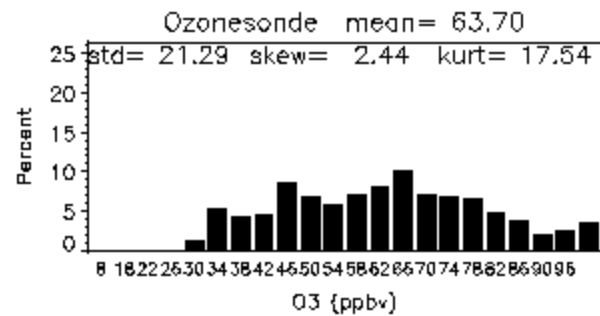
# Ascension Island v2L2 O3 difference time series



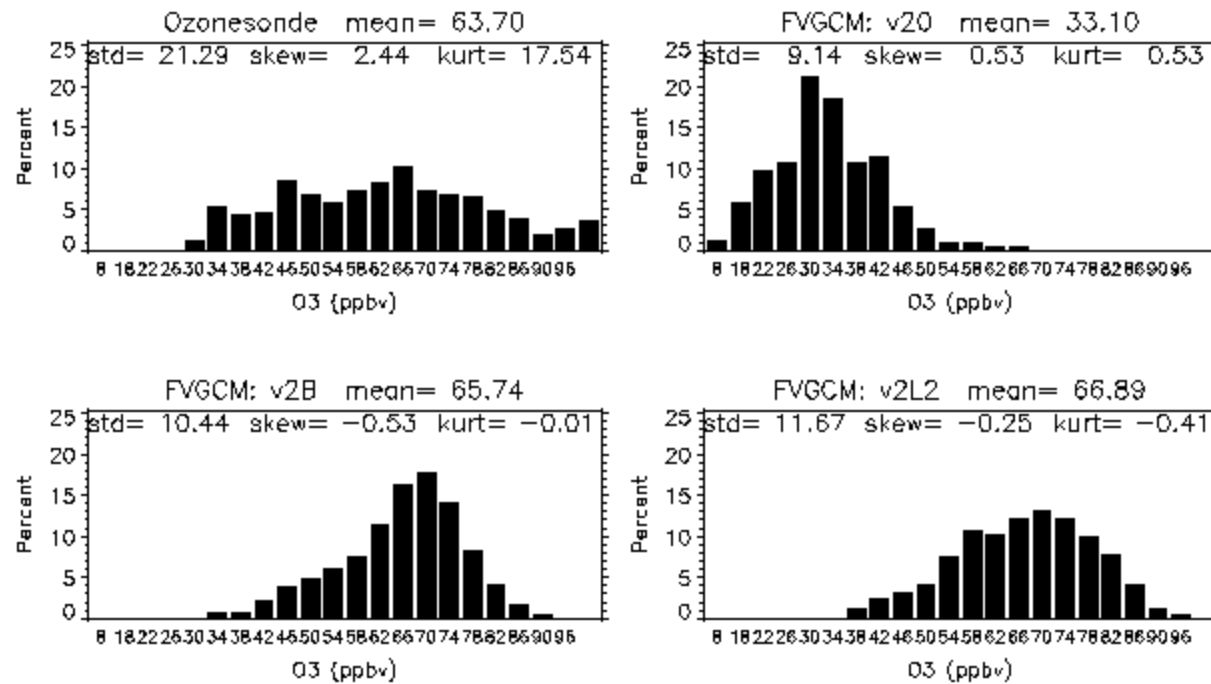
# O3 PDF at ASC( -7.98N -14.42E): 350.000 hPa



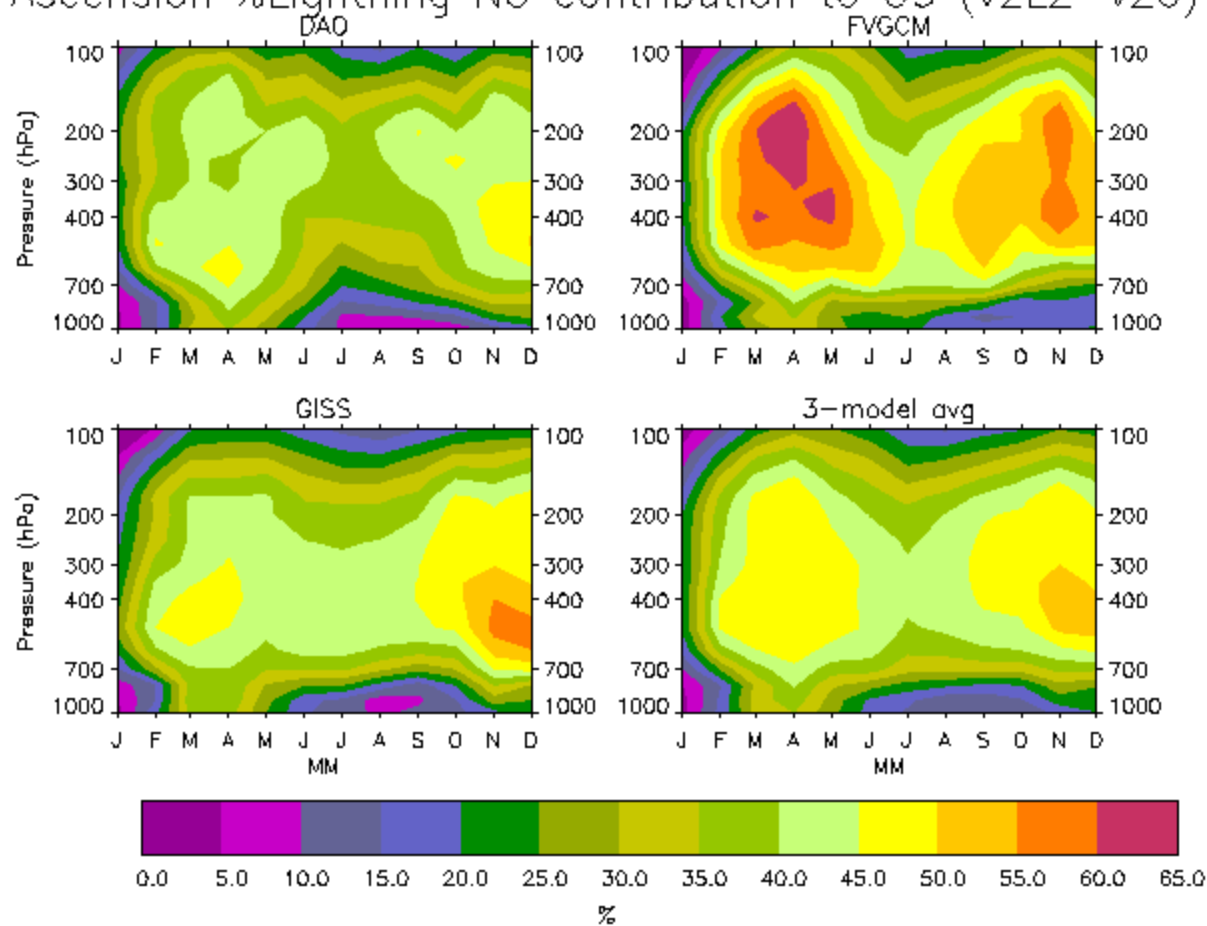
# O3 PDF at ASC( -7.98N -14.42E): 350.000 hPa



# O3 PDF at ASC( -7.98N -14.42E): 350.000 hPa



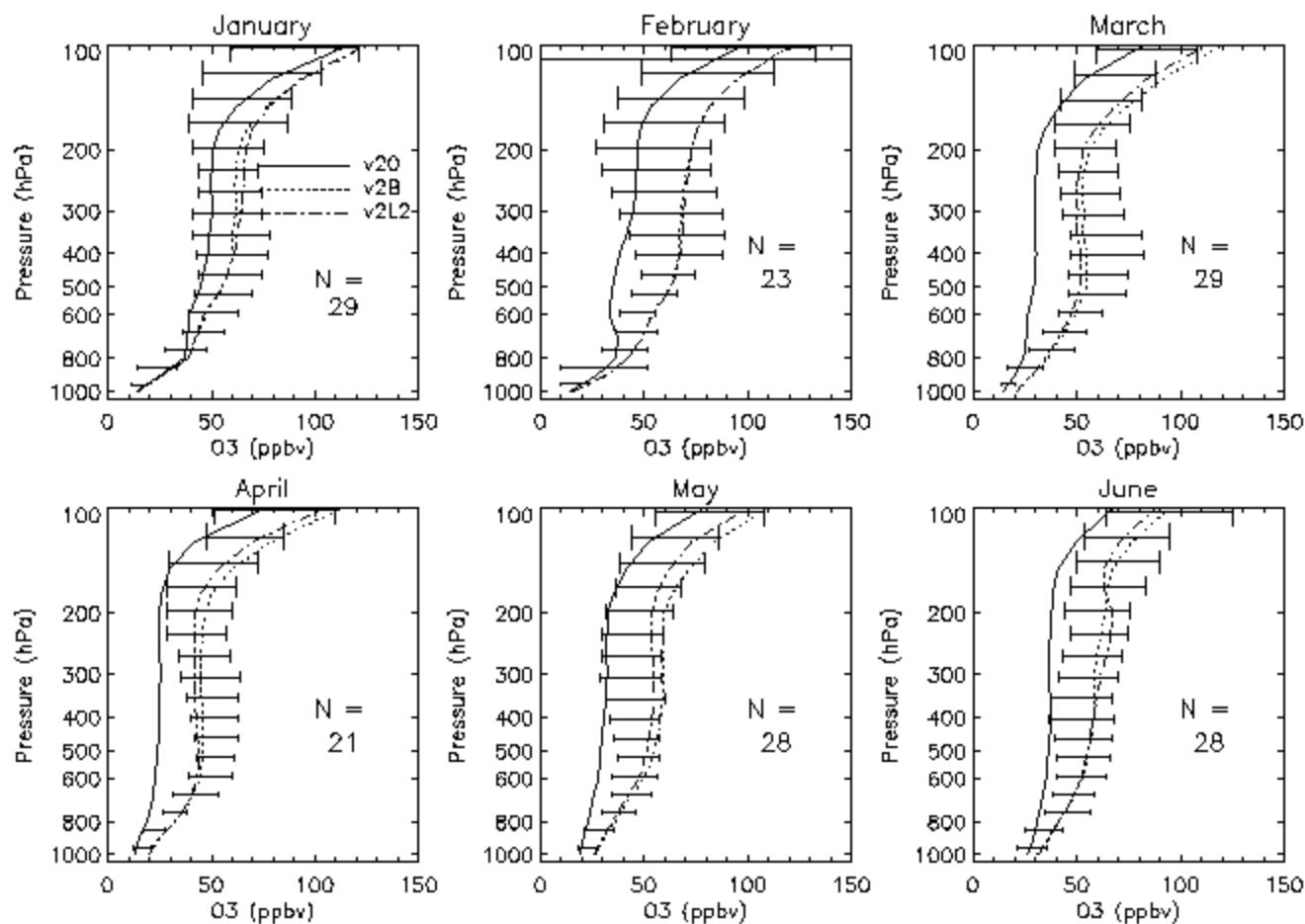
# Ascension %Lightning NO contribution to O3 (v2L2-v20)



# Summary of Ascension Island comparison

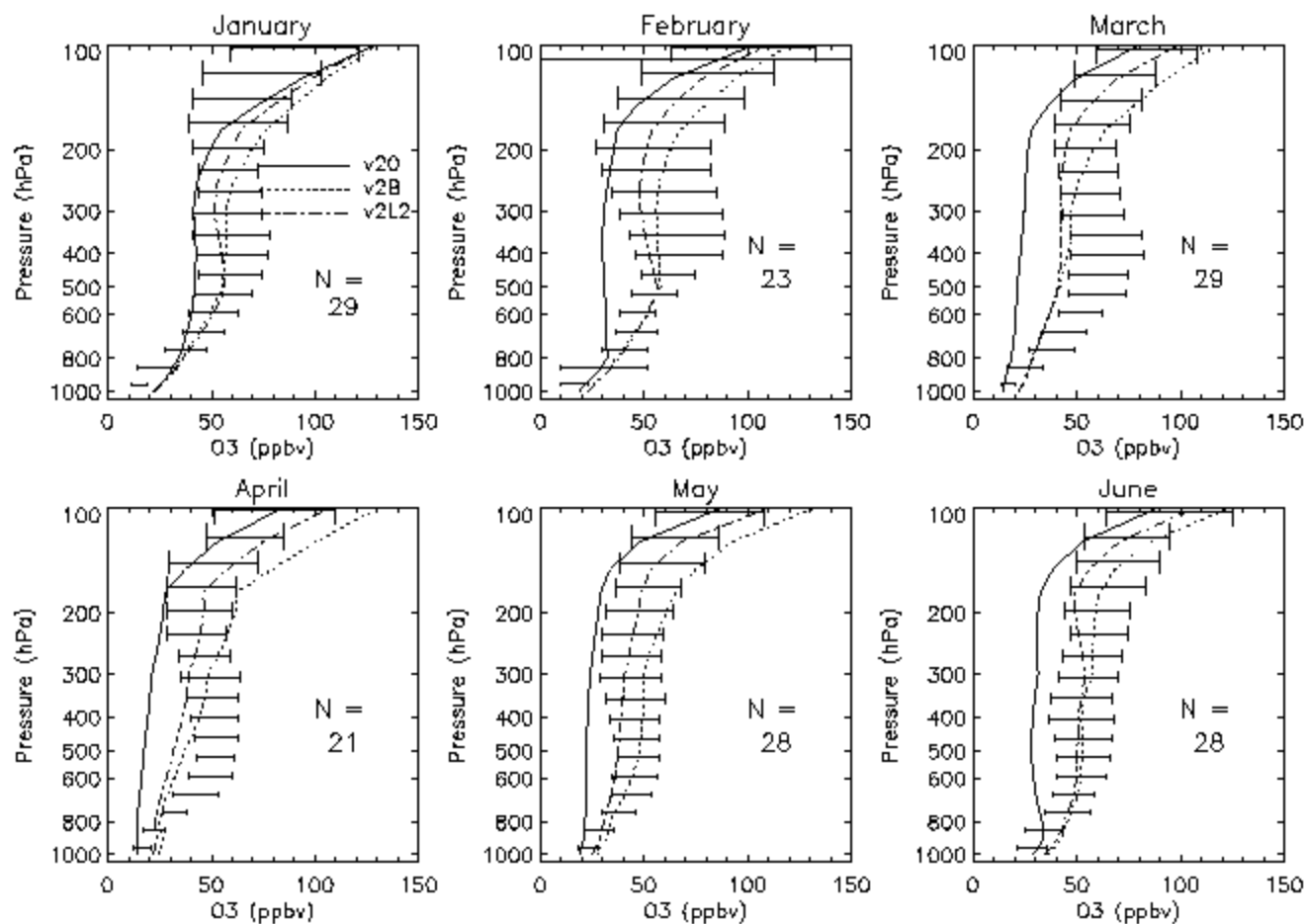
- DAO:
- In upper troposphere, 5-15 ppbv more O<sub>3</sub> in new run during Sep-Nov, bringing model closer to observed values
- Lightning contribution of 35-45% to O<sub>3</sub> in upper troposphere
- GISS:
- Upper tropospheric O<sub>3</sub> in new lightning run 5-15 ppbv < O<sub>3</sub> in default run for November – June period; GISS cloud tops too low
- Lightning contribution of 35-50% to O<sub>3</sub> in upper troposphere
- FVGCM:
- With default or new lightning- High-bias above ~300 hPa.
- (unobserved) linear increase with height during several months
- Lightning contribution of 40 to >60% to O<sub>3</sub> in upper troposphere
- ALL:
- Improvement in shape of frequency distribution of 350 hPa ozone mixing ratios

site: Ascension ( -7.98 deg lat, -14.42 deg lon), model: DAO

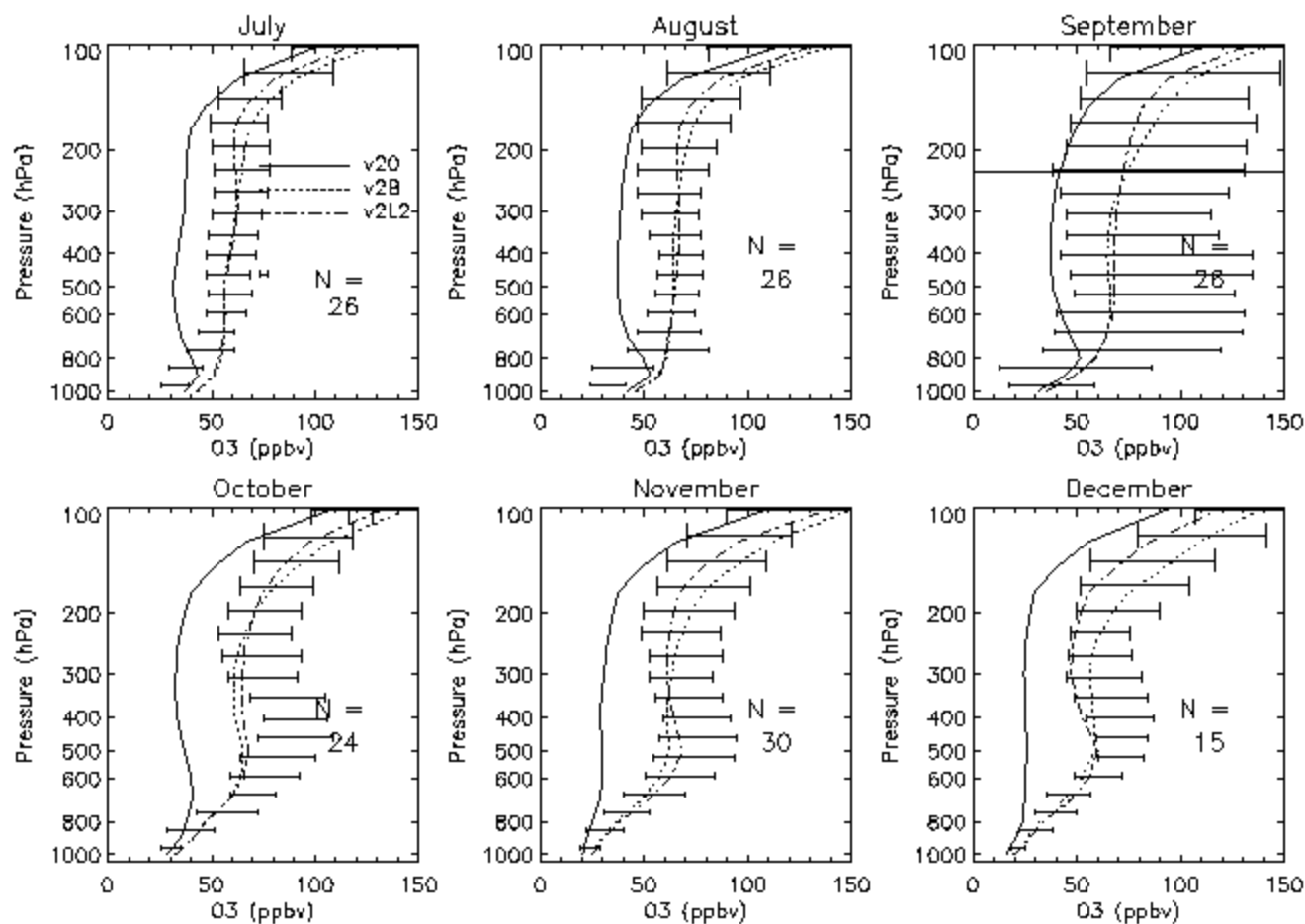




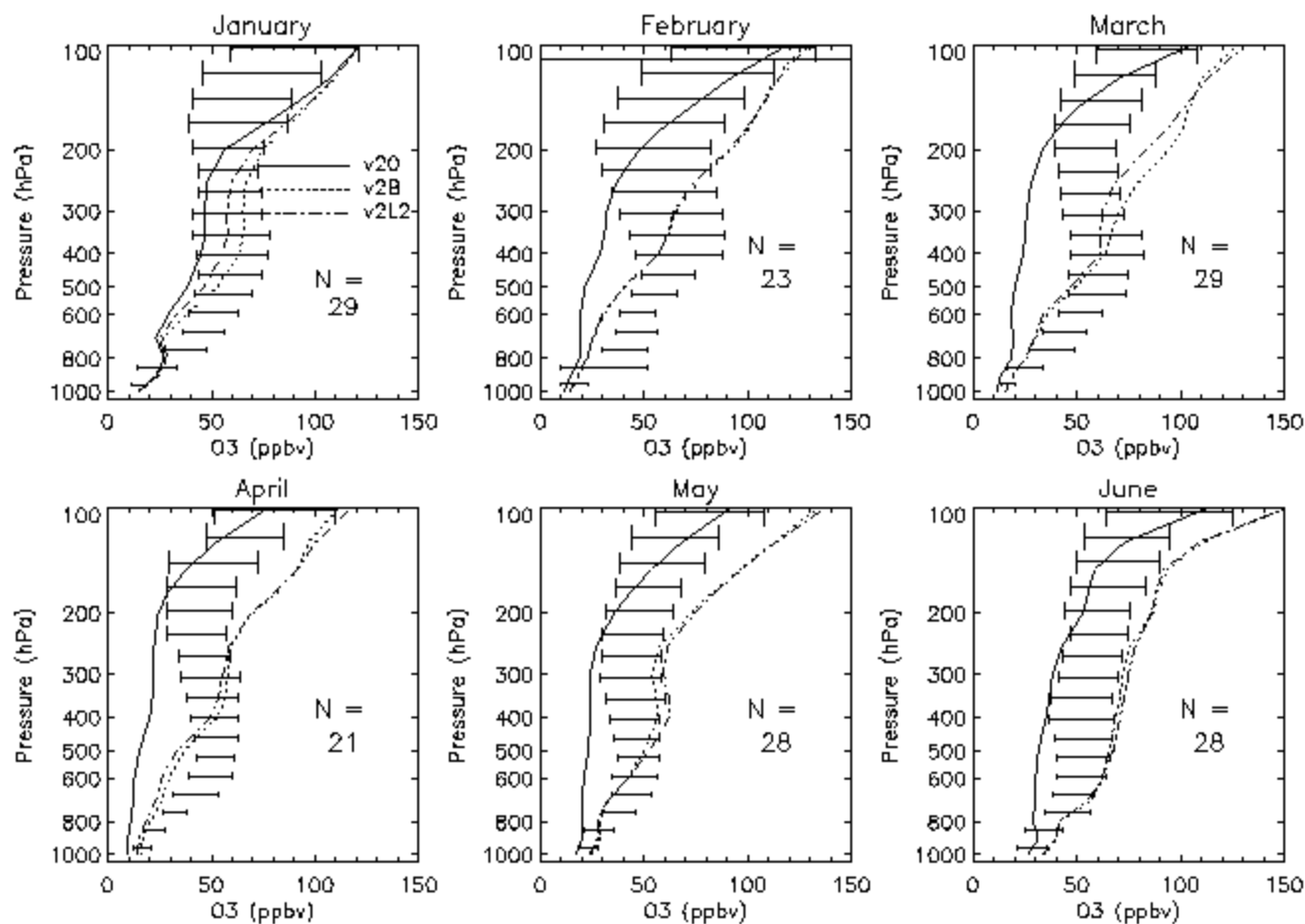
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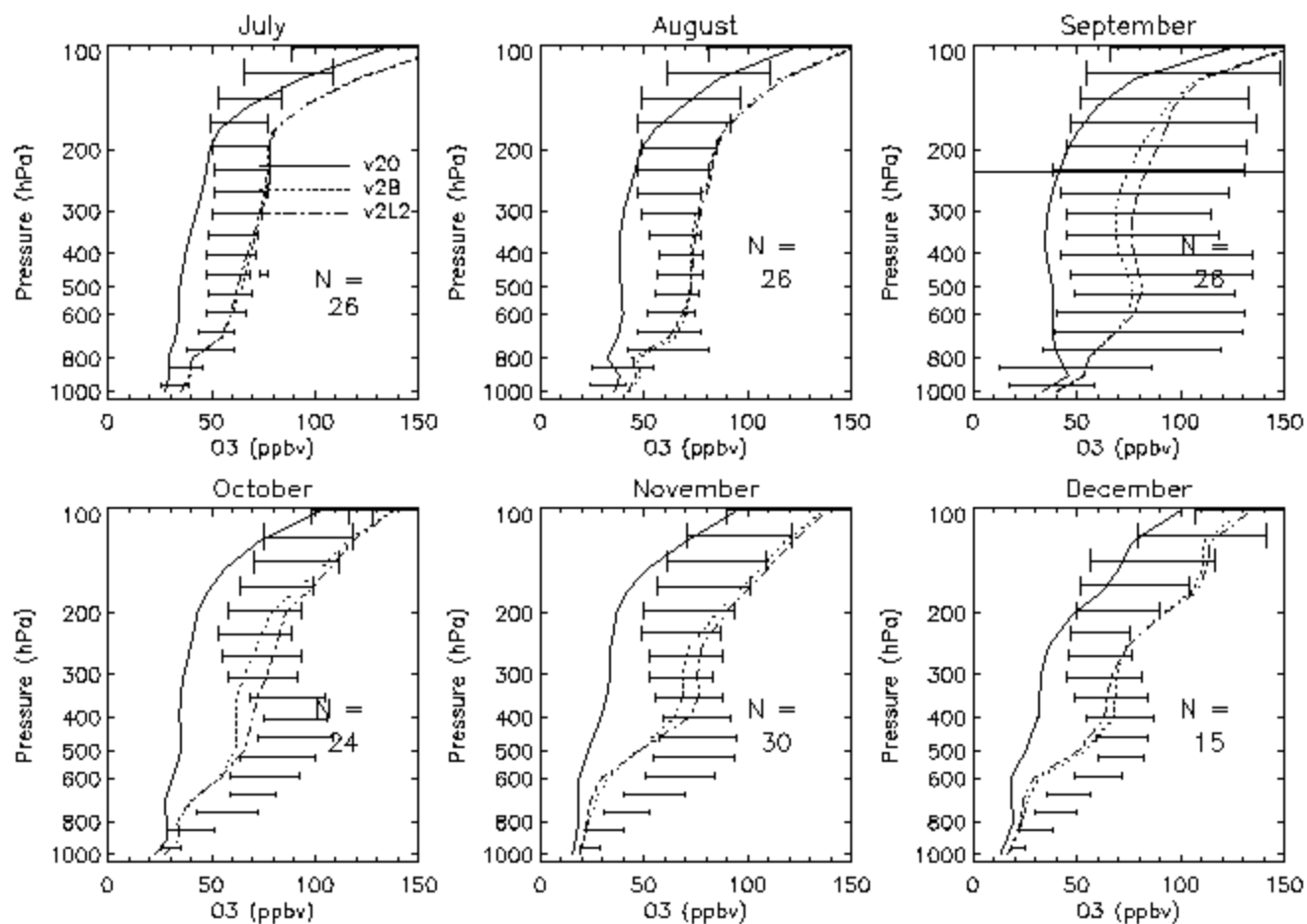
site: Ascension ( -7.98 deg lat, -14.42 deg lon), model: GISS



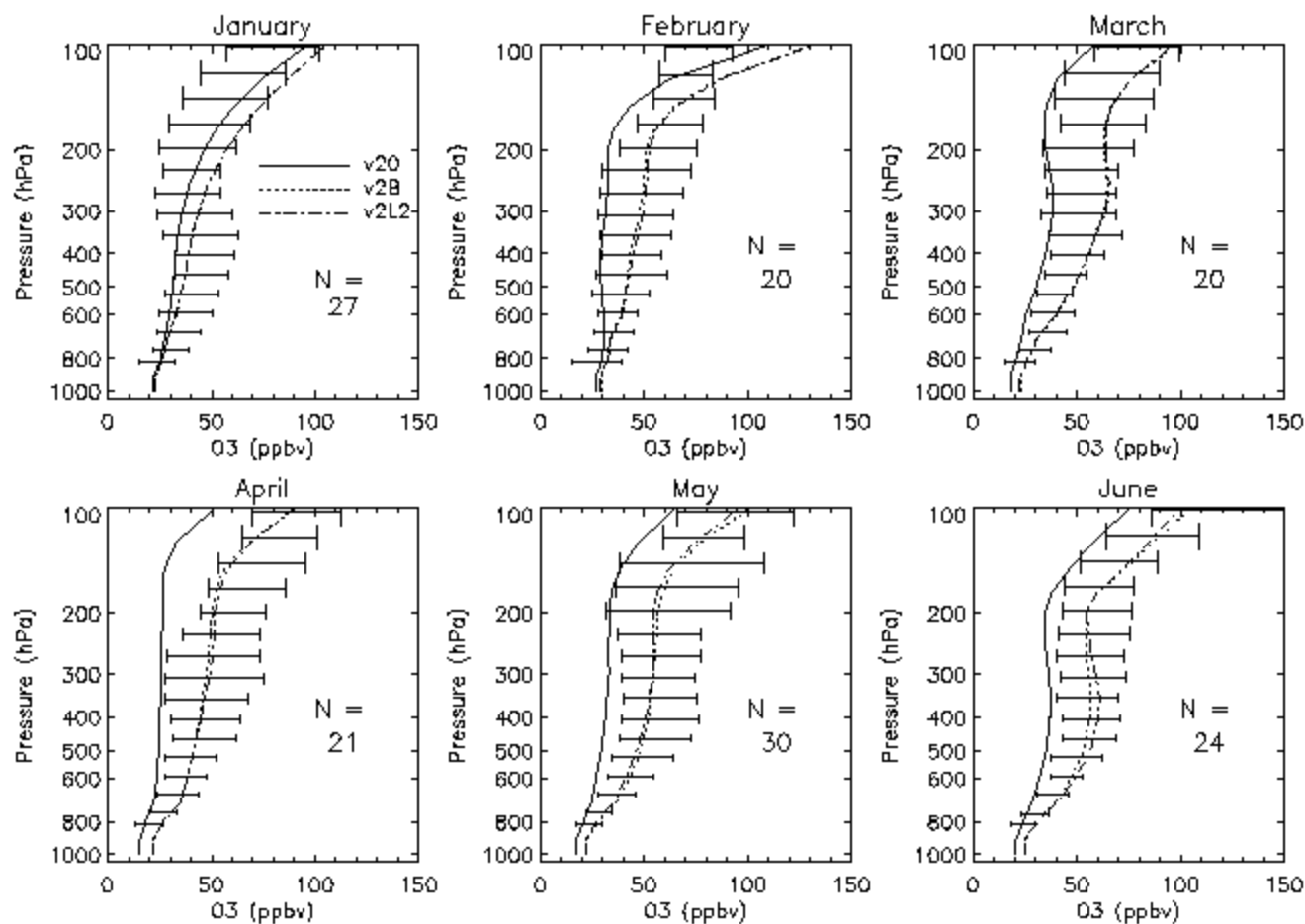
site: Ascension ( -7.98 deg lat, -14.42 deg lon), model: FVGCM



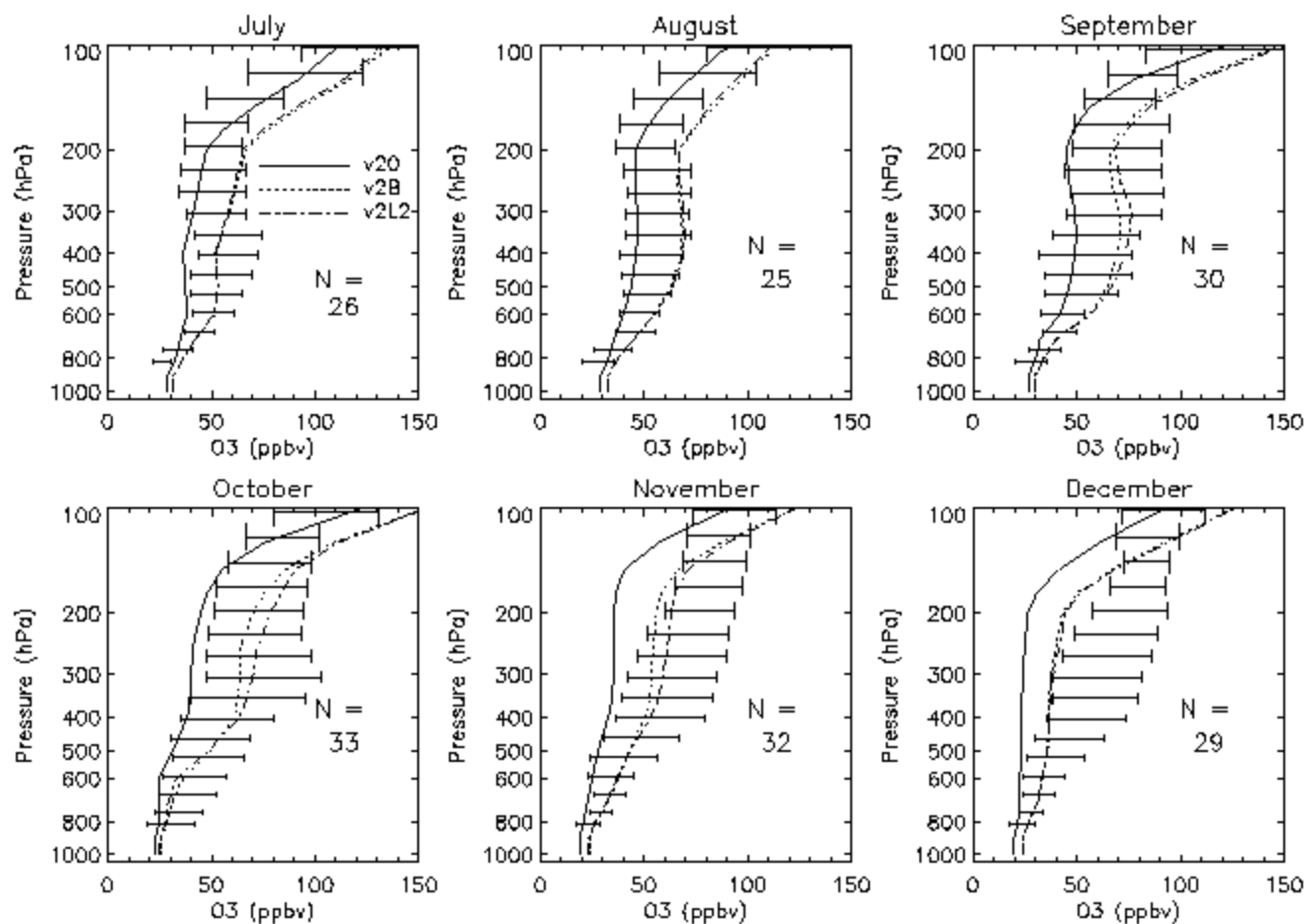
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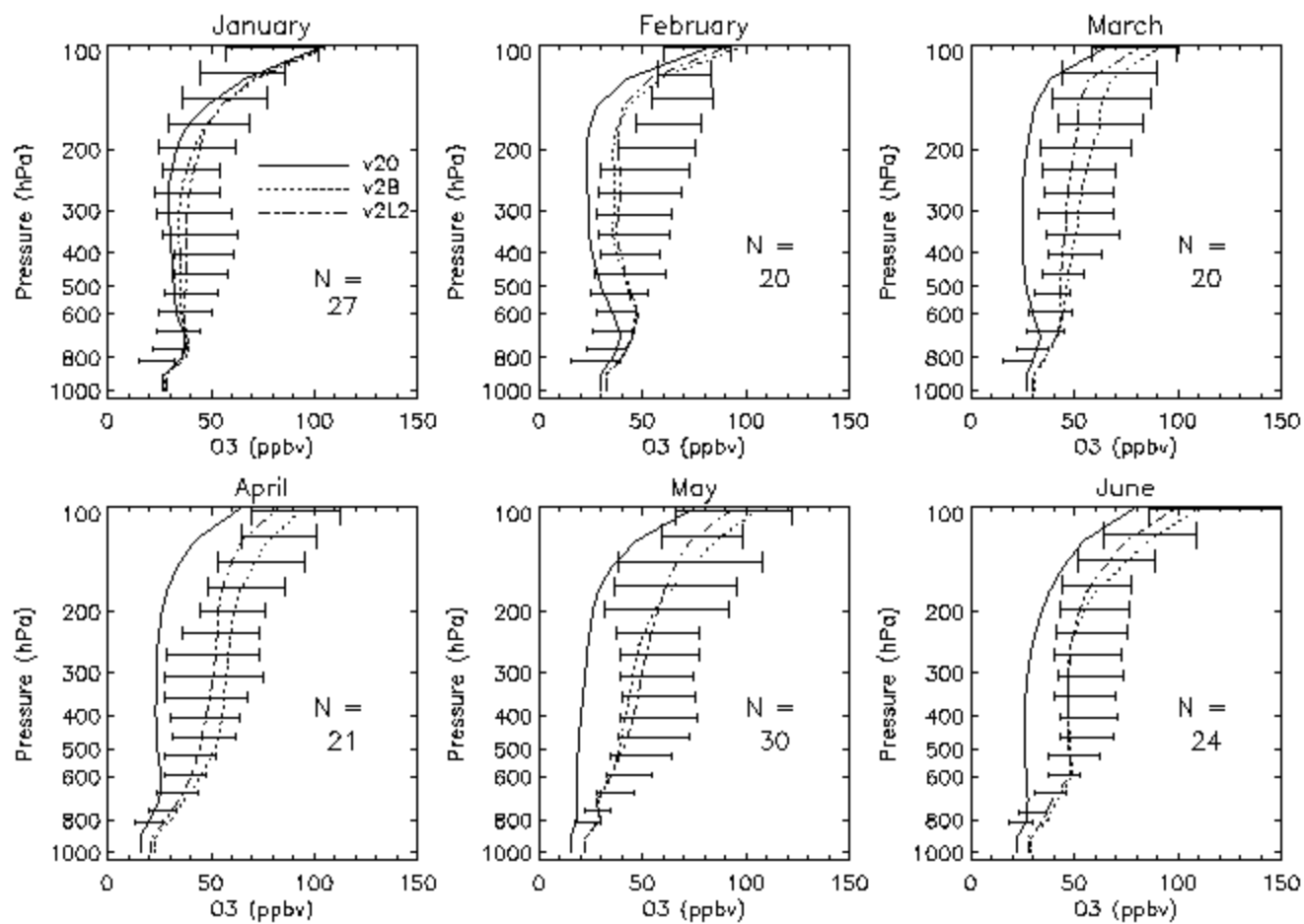
site: Nairobi ( -01.27 deg lat, +36.80 deg lon), model: DAO



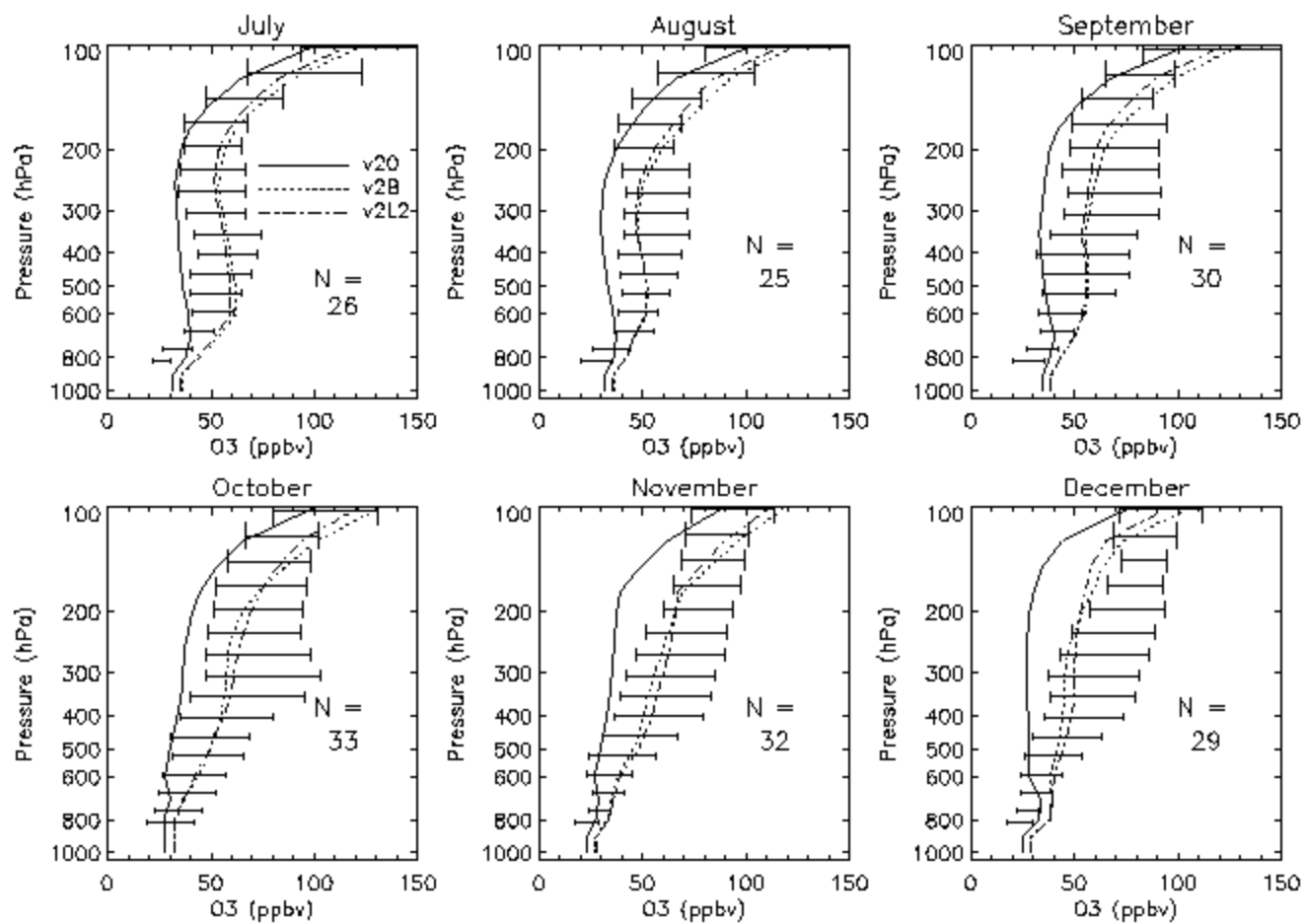
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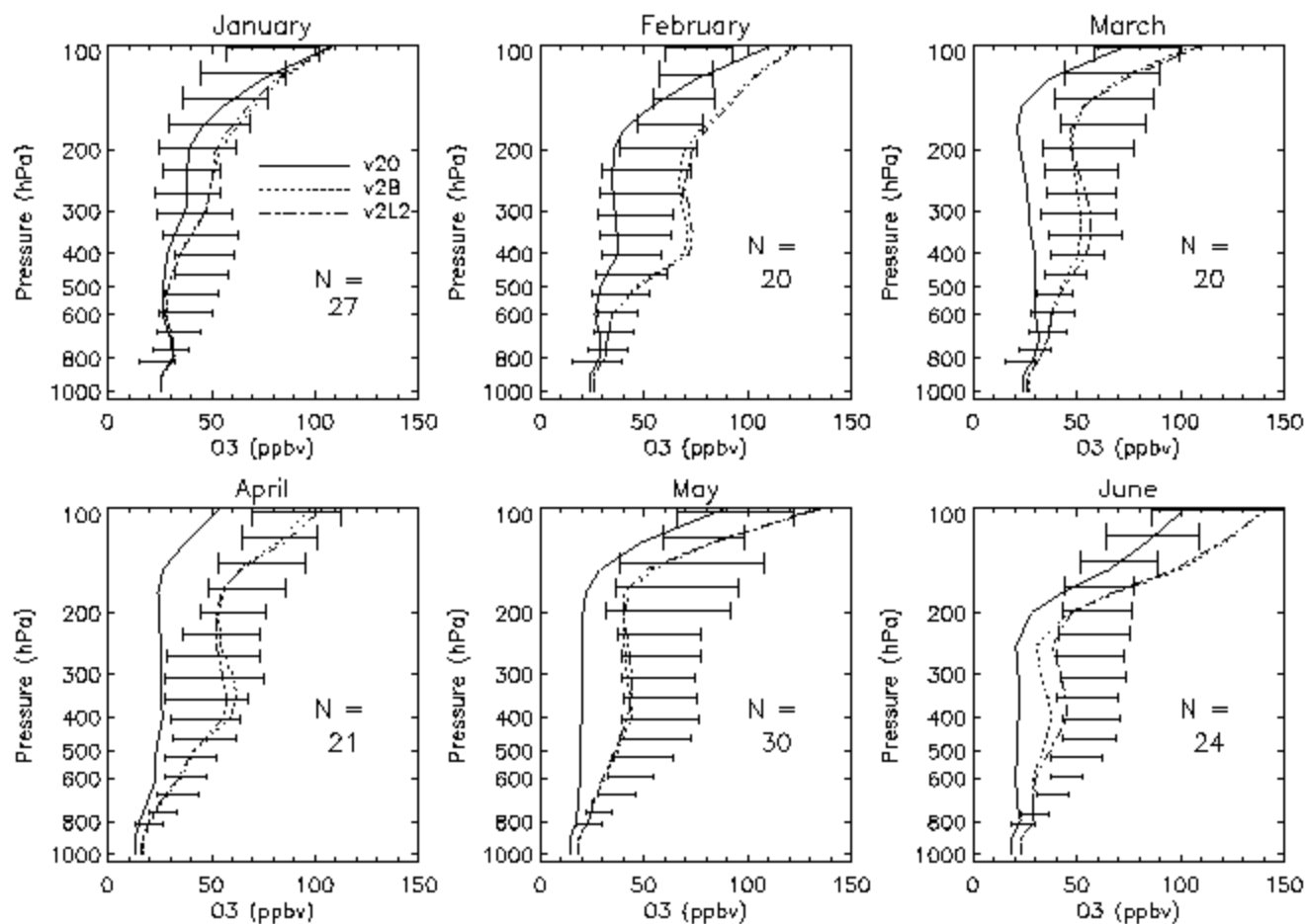


site: Nairobi ( -01.27 deg lat, +36.80 deg lon), model: GISS

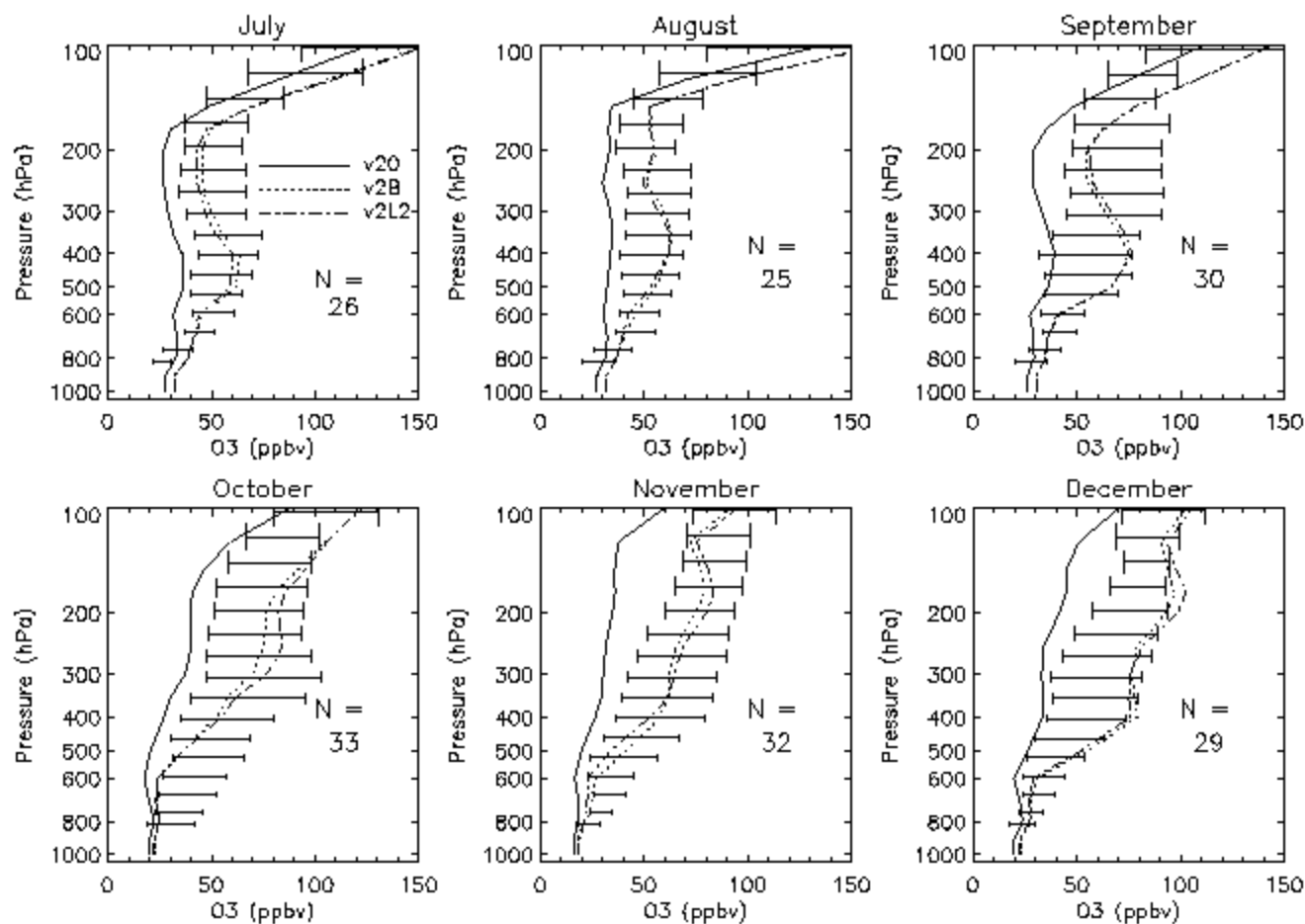




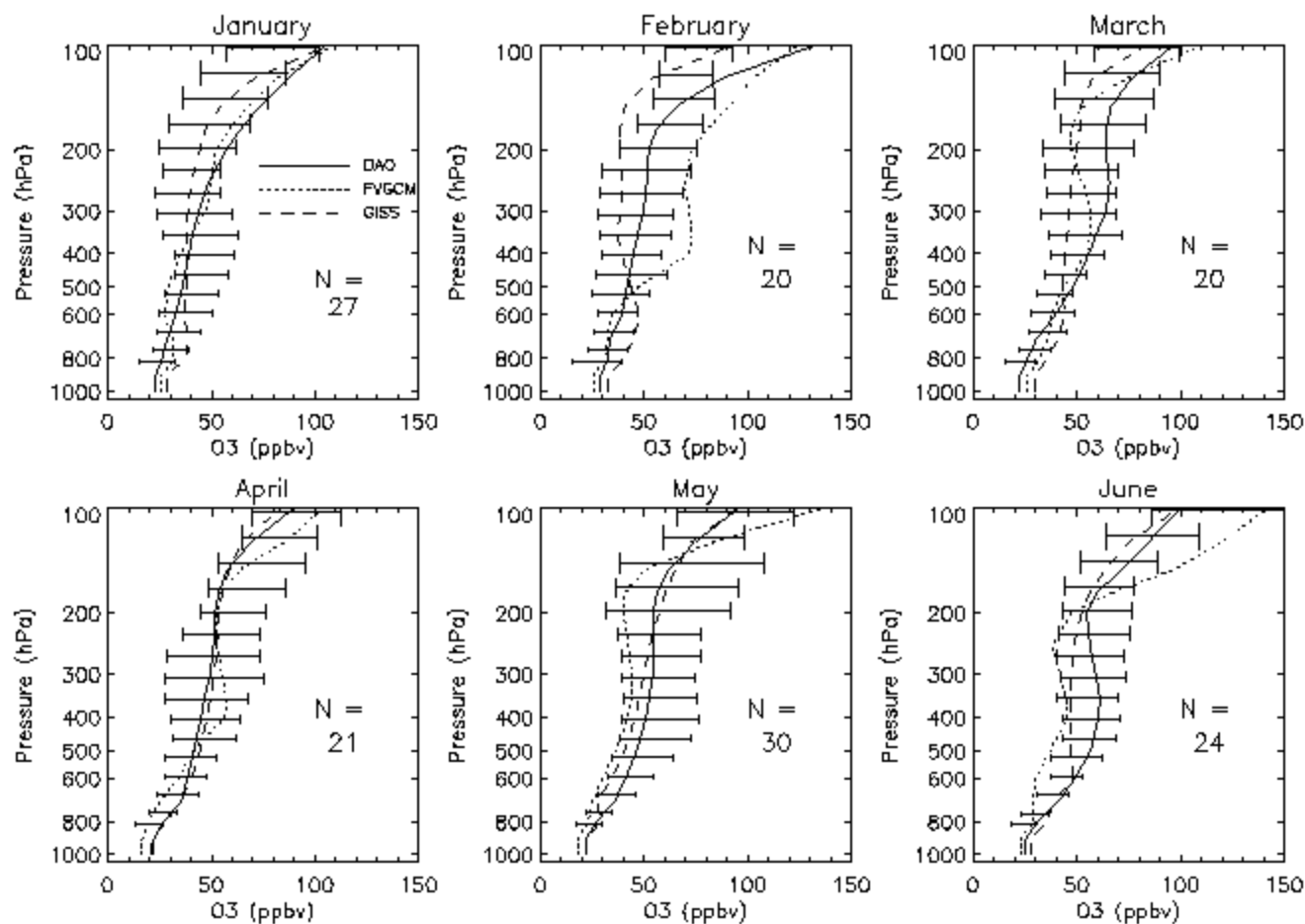
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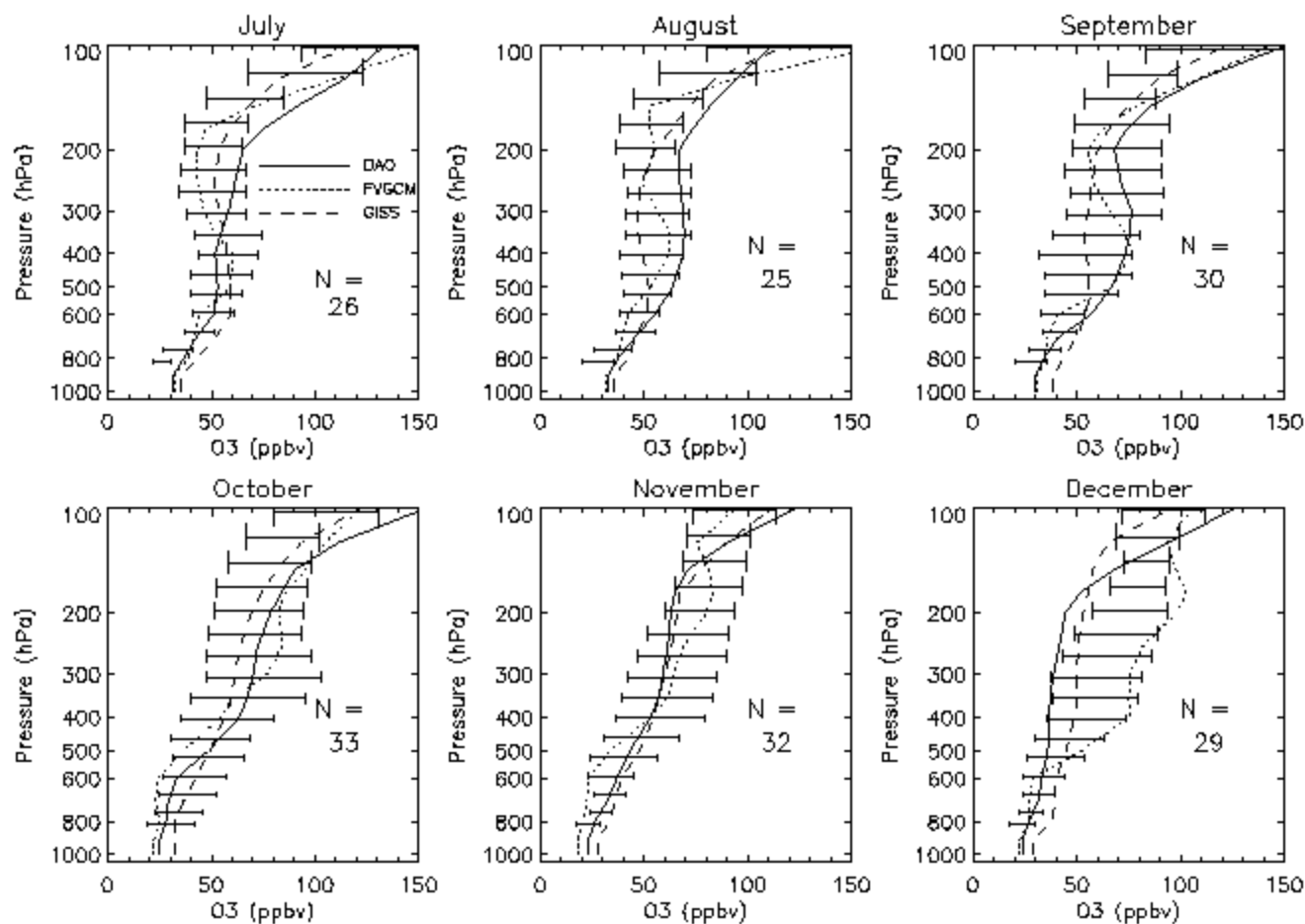
site: Nairobi ( -01.27 deg lat, +36.80 deg lon), model: FVGCM



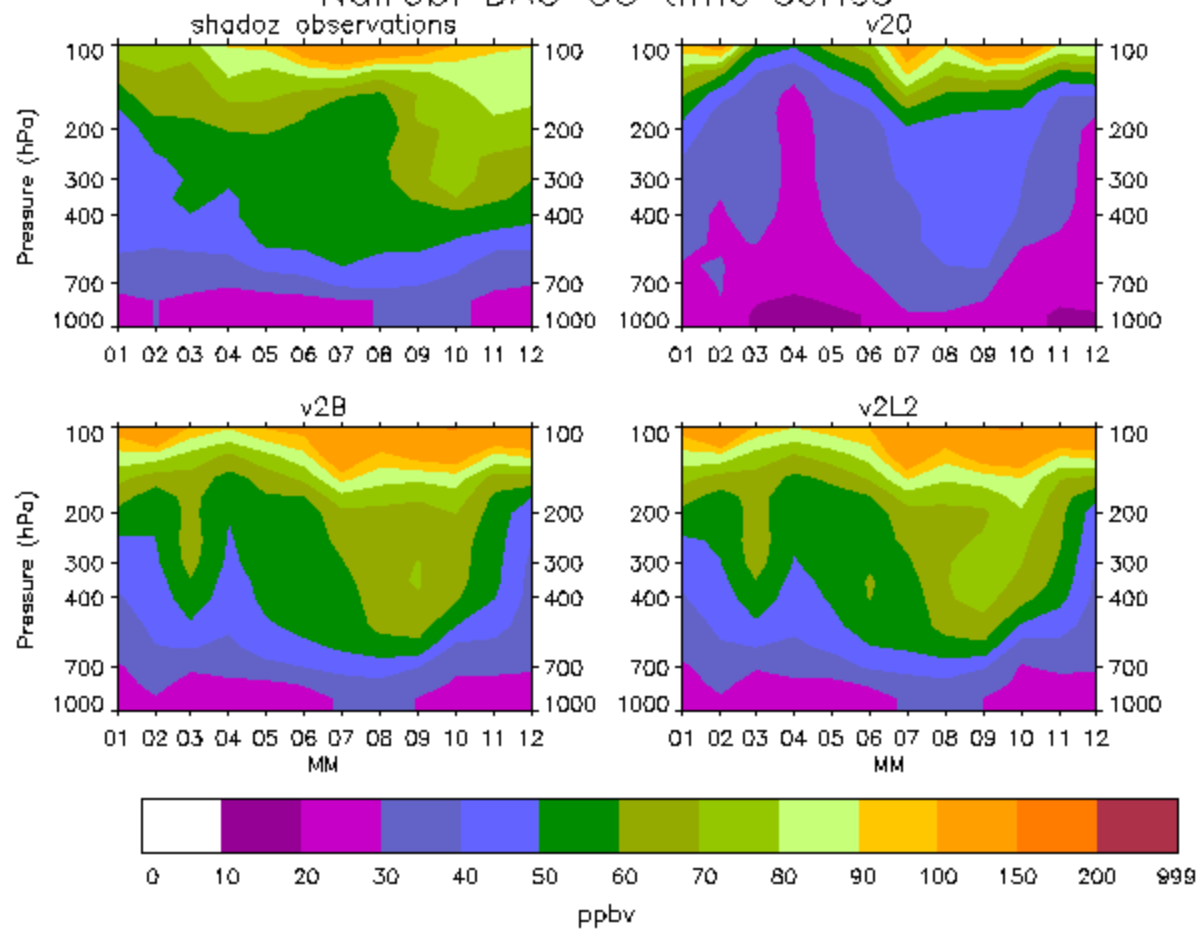
site: Nairobi ( -01.27 deg lat, +36.80 deg lon), lightning flag: v2L2



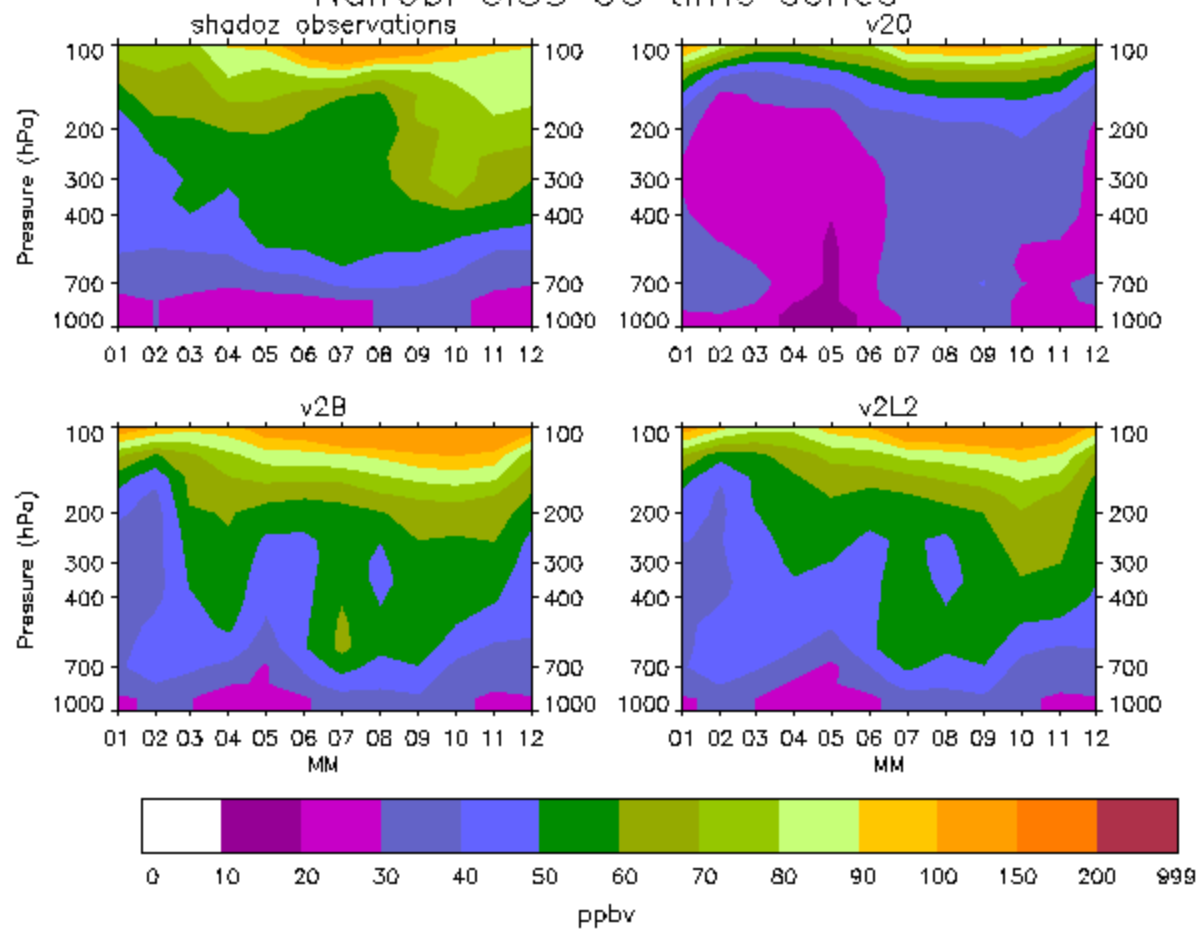
site: Nairobi ( -01.27 deg lat, +36.80 deg lon), lightning flag: v2L2



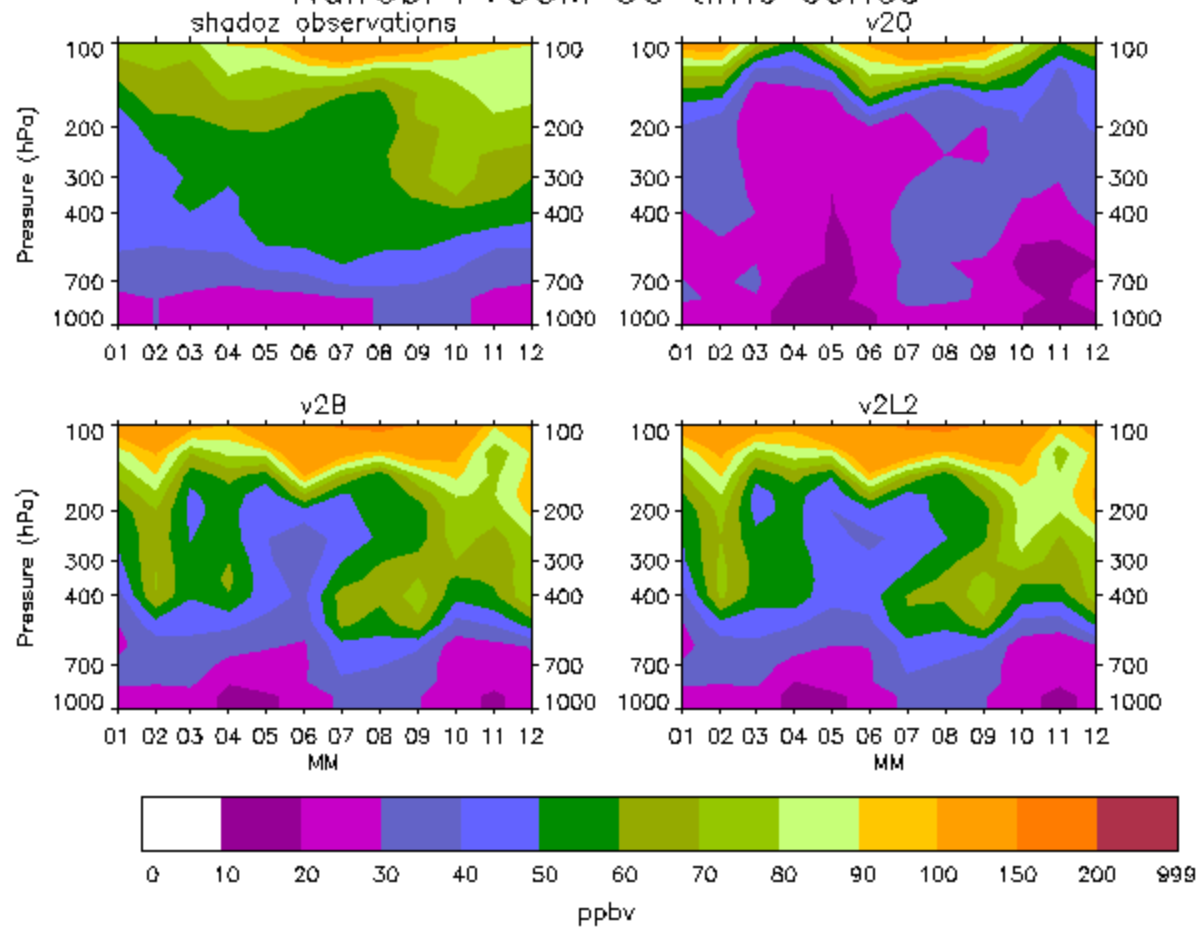
# Nairobi DAO O3 time series

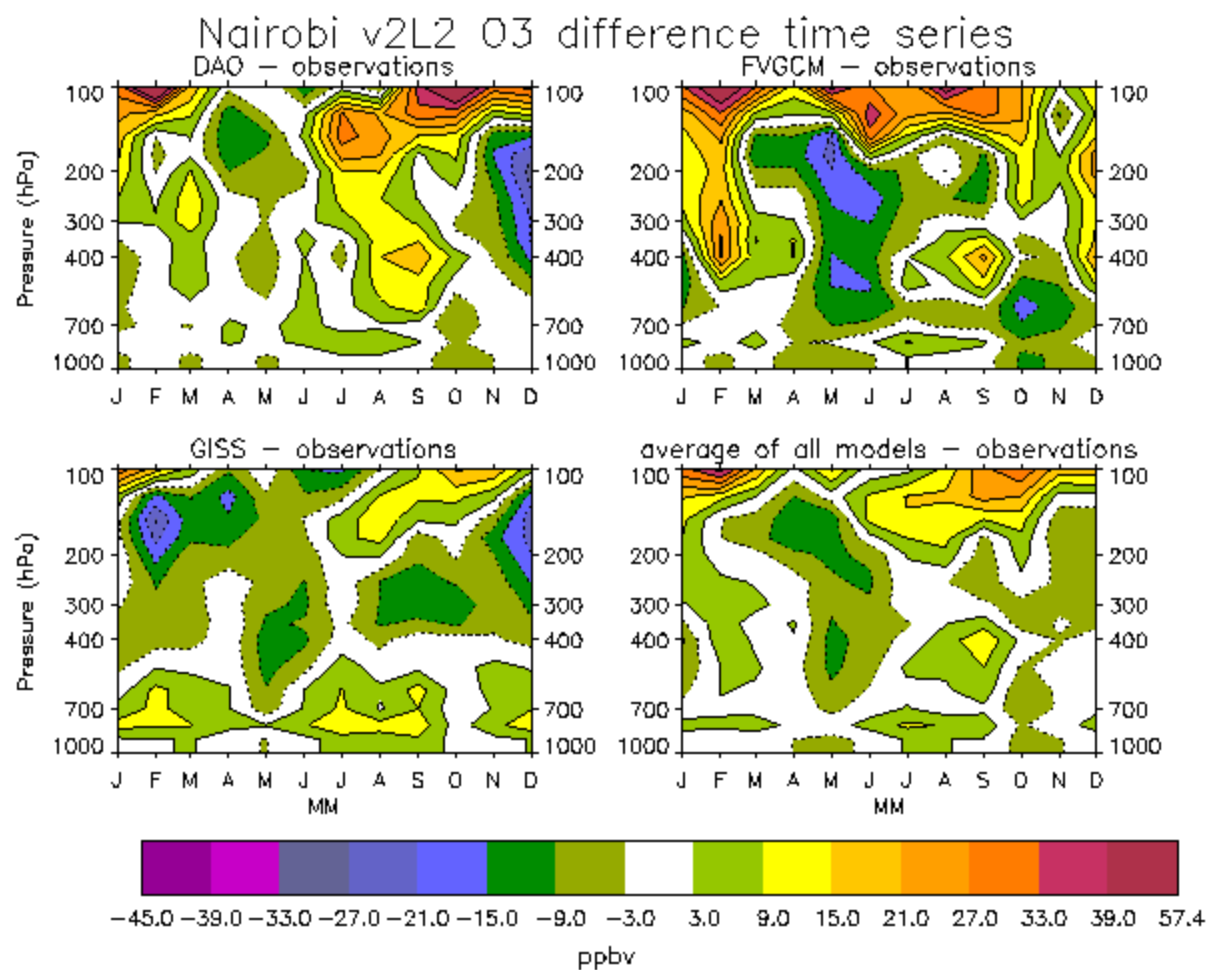


# Nairobi GISS 03 time series



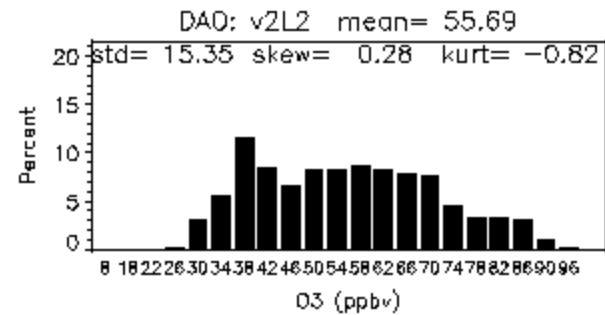
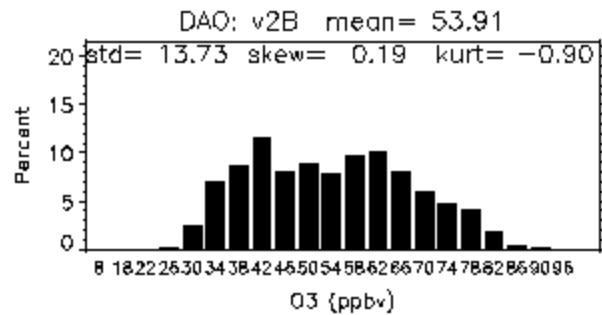
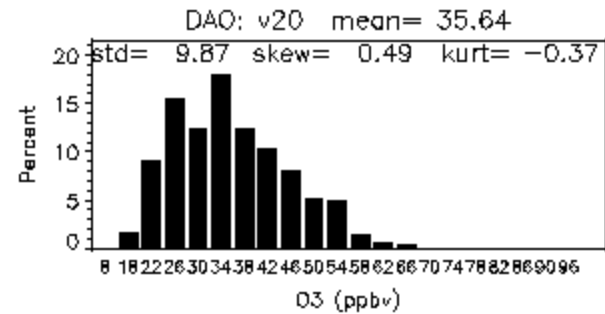
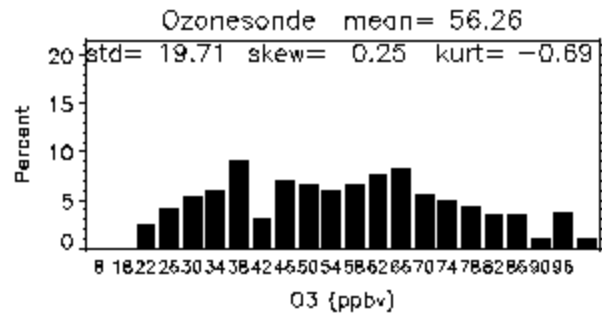
# Nairobi FVGCM 03 time series



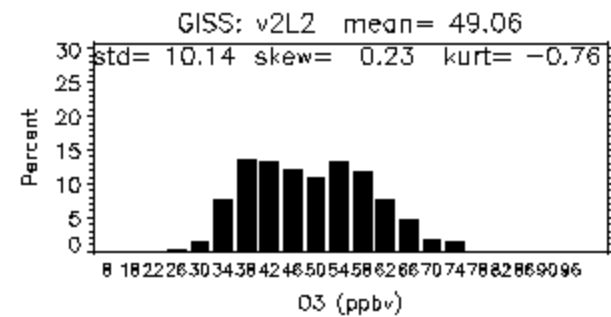
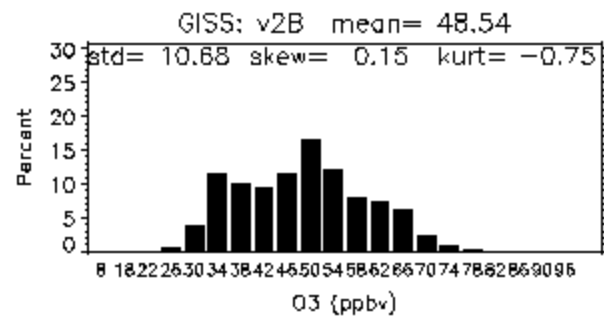
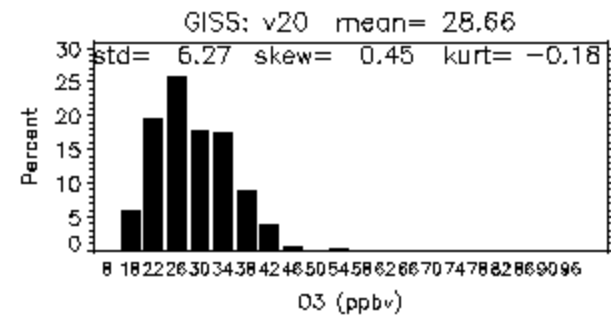
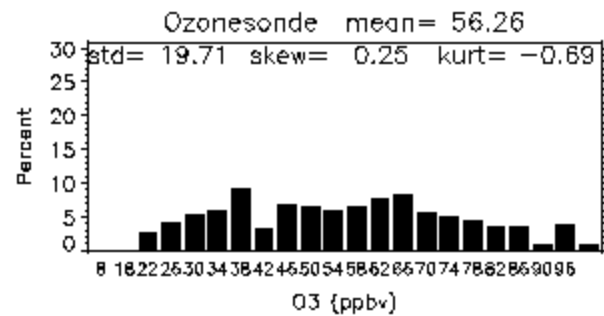




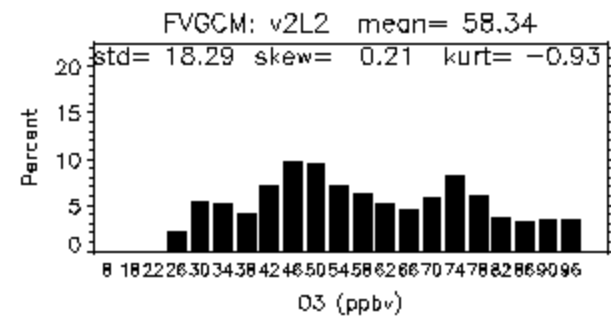
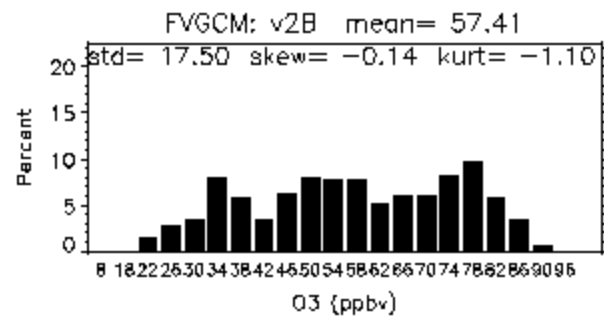
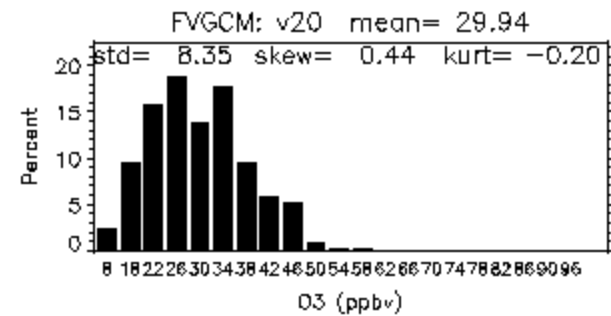
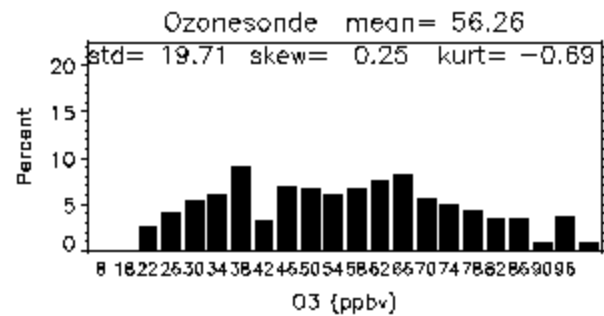
# O3 PDF at NAI( -01.27N +36.80E): 350.000 hPa



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# O3 PDF at NAI( -01.27N +36.80E): 350.000 hPa



# Nairobi %Lightning NO contribution to O3 (v2L2-v20)

